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ABSTRACT

A survey of elementary, middle/junior high, and high school principals in central Appalachia examined their use of e-mail and factors influencing that use. The survey was sent to a stratified random sample of 620 principals in Kentucky, Tennessee, Virginia, and West Virginia; 375 usable responses were received. Respondents provided data on demographics, accessibility to hardware and software, experience and training on computers and e-mail, uses of e-mail, and factors influencing their use or non-use of e-mail. E-mail was used by 59.7 percent of respondents. Predictors of e-mail usage were previous computer experience, accessibility to resources, and training. There were no differences between users and non-users with respect to gender, age, highest degree earned, or total years of educational experience. Use of e-mail by superiors, fellow principals, or teachers, and keyboarding skills were not indicators of e-mail usage. Principals used e-mail primarily for administrative tasks and secondarily for accessing and retrieving information. The primary methods for training in computer and e-mail skills were self-teaching, local courses, conferences or workshops, spouses or friends, colleagues, and on-site consultants. E-mail users had hardware and software resources, training, support, and encouragement to use e-mail. Non-users were uncomfortable with the technology. Principals must be role models for the use of technology. E-mail has the potential to break down barriers of geographic isolation and instill a sense of community. If future educational leaders are to meet the challenges of an information age, colleges must provide instruction in the use of computers and e-mail. Contains 92 references and the survey questionnaire. (TD)

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ED 408 135

FACTORS AFFECTING USE OF E-MAIL BY PUBLIC SCHOOL PRINCIPALS OF THE CENTRAL APPALACHIAN REGION

A Dissertation

Presented to

the Faculty of the

Department of Educational Leadership and Policy Analysis

East Tennessee State University

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Education

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by

Micheal T. Carter

May 1997

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APPROVAL

This is to certify that the Graduate Committee of

MICHEAL TRUMAN CARTER

met on the

1st day of April, 1997.

The committee read and examined his dissertation, supervised his defense of it in an oral examination, and decided to recommend that his study be submitted to the Graduate Council, in partial fulfillment of the requirements for the degree of Doctor of Education in Educational Leadership and Policy Analysis.

Marie Hill
Chairperson, Graduate Committee

Jack Rhoton

Louise L. MacKay

Signed on behalf of
the Graduate Council

Interim Dean, School of Graduate Studies

ABSTRACT

FACTORS AFFECTING USE OF E-MAIL BY PUBLIC SCHOOL PRINCIPALS OF THE CENTRAL APPALACHIAN REGION

by

Micheal T. Carter

The purposes of this study were to determine the factors that influence the use or non-use of e-mail by principals, the purposes for which e-mail messages were sent and received, and the impact of experience and training in the areas of computers and e-mail.

A survey was sent to a stratified random sample of 620 elementary, middle/junior high, and high school principals of the Central Appalachian Region. The respondents were asked to provide descriptive data regarding demographics, accessibility to hardware and software, experience and training on computers and e-mail, uses of e-mail, and items that influence their use or non-use of e-mail.

Eleven research questions and 10 hypotheses were addressed. Data analysis included descriptive statistics, chi-square, ANOVA, multiple regression, and factor analysis. At the .05 level of significance eight null hypotheses were retained and two rejected. Factor analysis identified four factors for e-mail users and five factors for non-users.

E-mail was used by 59.7% of respondents. There was no relationship between users and non-users with respect to gender, age, highest degree earned, or total years of educational experience. The predictors of e-mail usage were previous computer experience, accessibility to resources, and training. Use of e-mail by superiors, fellow principals, and teachers and keyboarding skills were not indicators of e-mail usage. Principals primarily use e-mail for administrative tasks and secondarily for accessing and retrieving information.

Training is essential to the effective implementation and usage of e-mail. The primary methods for both training in computer skills and e-mail skills were self-teaching, local courses, conferences/workshops, spouses or friends, colleagues, and on-site consultants.

The factor analysis revealed that e-mail users have hardware and software resources, training, support, and encouragement to use e-mail to obtain educationally beneficial and appropriate information. Non-users were not comfortable with the technology.

If principals are to be effective in an information age, they must be cognizant of e-mail's capabilities and potential ramifications upon the educational profession. Principals must provide the role model for the use of technology. E-mail has the potential to break down barriers of geographical isolation and instill a sense of community. If future educational leaders are to be prepared to meet the challenges of an information age, colleges of education need to provide instruction in the use of computers and e-mail.

INSTITUTIONAL REVIEW BOARD APPROVAL

This is to certify that the following study has been filed and approved by the Institutional Review Board of East Tennessee State University.

Title of Project Factors Affecting Use of E-mail by Public School Principals of the Central Appalachian Region

Principal Investigator Micheal T. Carter

Department Educational Leadership and Policy Analysis

Date Submitted December 8, 1995

Institutional Review Board Approval

Chairman David W. Walters MD

DEDICATION

To my wife, Susan, my four children, Petrea, Jeffrey, Joshua, and Caryn.

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I would like to thank my committee chairperson, Dr. Marie Hill, for her support and encouragement in completing this study. She provided support and confidence in my abilities to accomplish this study. I gleaned from her example the importance of conducting research to improve and advance the educational profession. I will always be indebted to her.

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CHAPTER 1

INTRODUCTION

To meet the needs of emerging global and societal conditions, education is at a crossroads (Glines, 1991). Because of the challenges facing the educational community, new ideas and innovations need to be assessed to determine their viability. In the late 1400s, explorers anxiously awaited development of effective maps and navigational tools for safe guidance across oceans.

In the information age of the 21st century, need for a new generation of navigational tools is manifest (Aust & Klayder, 1991). Individuals must be able to communicate with each other and with computers. Information could come from any corner of the global society (Taitt, 1993). Communication is central to the effectiveness of any organization. Use of telecommunication technologies presents a new twist to the communication process (Zahn, 1991). Telecommunications include computer-based information systems utilizing modems hooked to computers allowing communication to take place over telephone lines (Honey & Henriquez, 1993). Electronic mail (e-mail), tele-conferencing, video-conferencing, groupware, and computer bulletin boards are examples of telecommunication technologies.

According to Zahn (1991), the full impact of such technologies in and on educational organizations has not been established. But with society impacted by the information age so quickly, educators must be cognizant of the nature, capabilities, and ramifications of technologies upon their culture/organization (Lewis, 1991). "Whether we want it or not, computer technology seems destined to change drastically many of the ways we administer and teach in public schools" (Guthrie, Garms, & Pierce, 1988, p. 297). Careful design and implementation of communication technologies are essential for education to meet societal needs. Current and emerging technologies have and will continue to impact and stimulate school reorganization and models for teaching and learning (Dede, 1993; Hawkins, 1993).

Telecommunication technologies possess the potential for changing educational paradigms in profound and productive manners (Merritt, 1991). Telecommunication adds vitality and excitement to instructional and administrative environments (Roempler & Warren, 1993). Both students and professional educators can become empowered by the possibilities (Honey & Henriquez, 1993; Kurshan, 1990; Merritt, 1991).

Statement of the Problem

In 1983, this country's educational system was judged to be at risk in the areas of mathematics, science, and technology (National Commission on Excellence in Education, 1983). How can today's students be prepared to enter a dynamic, global society that is so rapidly impacted by the information age if they are not being prepared for 21st century technologies? "Technology is changing at the speed of light, and there's a labor shortage of skilled workers" (Hoffman, 1993b, p. 33).

Although early expectations of computer usage never developed, computer technology that could be used within a school organization has been available since the 1950s. School administrators should be providing the leadership to insure that students are technologically prepared to enter the information age. However, questions have been raised about the technological leadership and management of schools

(Bozeman & Baumbach, 1995; Bozeman & Spuck, 1991; & National Policy Board for Educational Administration, 1989). With advances in computer and telecommunication technologies, a greater capability for enhancing instructional and administrative functions has developed (Ornstein, 1992).

E-mail is one means offering great potential to effectively navigate the oceans of information being generated. In the educational community, the full impact of e-mail has not been established. Careful design and implementation of e-mail for the benefit of school administration is essential. Use of e-mail in the school setting has the potential to impact the school organization and its leadership. Thus, the problem to be investigated in this study involves discovery of the factors that influence use of e-mail by public school principals.

Purpose of the Study

The purpose of this study was threefold. It was to determine: (a) the factors that influence the use of e-mail by public school principals, (b) the purposes for which e-mail messages were sent and received, and (c) the impact of experience and training in the areas of computers and e-mail.

Research Questions

A series of questions were addressed in this study. They were:

1. What is the profile of a school principal who uses e-mail?

2. Are there differences in e-mail use between elementary, middle, and high school principals?

3. Are there differences in e-mail use by principals in Tennessee, Kentucky, Virginia, and West Virginia?

4. How does accessibility impact the use of e-mail?

5. What types of messages are sent and received using e-mail?

6. Does the use of e-mail by superiors, fellow principals, or teachers influence the use of e-mail by the respondents?

7. How was access to e-mail financed?

8. By what means do respondents receive training in computers and e-mail?

9. Does the respondent's level of keyboarding skills influence the use of e-mail?

10. Does computer experience influence the use of e-mail?

11. What are the factors that may or may not influence the use of e-mail?

Hypotheses

The following hypotheses were formulated for this study:

Hypothesis 1: There is no relationship between e-mail use and gender, age, highest degree earned, and total years experience.

Hypothesis 2: There is no difference in e-mail use between elementary, middle, and high school principals.

Hypothesis 3: There is no difference in e-mail use between principals of Tennessee, Kentucky, Virginia, and West Virginia?

Hypothesis 4: There is no difference between level of use and accessibility to e-mail.

Hypothesis 5: There is no relationship between a principal's e-mail use and use of e-mail by superiors, fellow principals, or teachers.

Hypothesis 6: There is no relationship between e-mail training methods and the demographics of gender, age, and highest degree earned.

Hypothesis 7: There is no difference between use of e-mail and training methods for computers.

Hypothesis 8: There is no difference between use of e-mail and training methods for e-mail.

Hypothesis 9: There is no difference between the level of use of e-mail and keyboarding skills.

Hypothesis 10: There is no relationship between e-mail use and computer experience.

Significance of the Problem

Organizational communication has been greatly affected by use of e-mail because of the speed at which textual messages were sent and received (Hignite & Perreault, 1993). The world of business has accepted e-mail as a viable way to skirt conventional mail to send and receive messages and enhance the communication process within and outside the organization. Comprehension of the usefulness and potential of e-mail has become essential for corporate managers. By the year 2000, there may be as many as 40 million users of e-mail in the United States (Amini, 1993).

Businesses have used e-mail as a means to achieve greater flexibility, effectiveness, and efficiency in their business processes (Saraswat, 1991). Concomitant results could be achieved in the educational community. As it has become a necessity in the world of business, the potential and usefulness of e-mail must be determined in the educational community. Communication is a trait integral to the effectiveness of any organization and has significant implications for organizational communications. Education is involved with information dissemination. School administrators could use e-mail to lessen their administrative paperwork and routine tasks. Additionally, they could broaden their communication and access to senior management, thus improving principals' ability to enhance organizational effectiveness (Updegrove, 1991). E-mail can increase organizational effectiveness and efficiency and can change the nature and diversity of organizational interpersonal interactions (Schmitz & Fulk, 1991). E-mail provides a means to gather information and to exchange it quickly and efficiently (Spurgin, 1985).

A need exists to educate the future work force concerning the nature, capabilities, and impact of communication upon their lives (Lewis, 1991). According to Hoffman (1993a), "education . . . is the prerequisite for economic growth, especially in an increasingly global marketplace" (p. 6).

The role of schools in preparing students will be enhanced as school principals incorporate e-mail technology (Wishnietsky, 1991). Through the principal's example of using technology, the benefits and advantages of technology should filter to students. This action will empower both educators and students (Kurshan, 1990; Merritt, 1991). According to Naron and Estes (1986), "Information technologies are not just another passing educational fad" (p.31). E-mail is a powerful technology that cannot be overlooked in the educational community to meet future societal needs. Principals must accept their responsibilities to insure that students are properly prepared to enter the information age (Naron & Estes, 1986).

Limitations and Delimitations

1. The study was restricted to the electronic transmission of text in the form of messages and does not include voice mail, tele-conferencing, or facsimile (fax) services.

2. The study was limited to factors that affect an individual's use of e-mail.

3. The study involved principals from the four states of Tennessee, Kentucky, Virginia, and West Virginia that are served by the Appalachian Educational Laboratory (AEL).

Assumptions

This study was based upon the following assumptions:

1. Factors that affect use of e-mail can be identified.

2. The survey method is valid to obtain attitudes toward factors that affect use of e-mail.

Definitions of Terms

For the purposes of this study, the following definitions were used:

Asynchronous

Communication is non-simultaneous. Senders and receivers do not have to attend to the same communication simultaneously.

Central Appalachian Region

The states of Tennessee, Kentucky, Virginia, and West Virginia.

Communication

Process of transmitting meanings from a sender to a receiver (Hoy & Miskel, 1991).

Electronic mail

Referred to in this study as e-mail, the ability to send and receive information, messages, and files electronically from one computer to another computer (Crum, 1988; Johnson & White, 1990.

Internet

A loose composite of thousands of computer networks that forms an international network of networks or internetwork (Dern, 1994; Laquey & Ryer, 1993).

Message

Single transmission of information for electronic delivery.

Modem (an acronym for Modulator-DEModulator)

A device that enables computers to communicate over telephone lines. Digital computer signals are converted to telephone analog signals and vice versa.

Network

A group of computers that can communicate electronically.

Organizational infrastructure variable

Variable that might influence the use of e-mail and be beyond the control of an individual, i.e. pressure to use e-mail or financial considerations (Crum, 1988).

Telecommunications

Computer based information systems using modems attached to the computer that allow communication to take place over phone lines (Honey & Henriquez, 1993).

Overview of the Study

This dissertation is organized into five chapters:

Chapter 1 presents the introduction, statement of the problem, purpose of the study, research questions, hypotheses, significance of the problem, limitations and delimitations, definition of terms, and an overview of the study.

Chapter 2 is a review of related literature. It includes discussions of organizational communication considerations; theories of information technologies; the nature of e-mail; use of e-mail in business, higher education, and public education; and a conclusion.

Chapter 3 discusses the methodology for the study. It includes a discussion of the research design, population and sampling method, data collection, dependent variables, independent variables, and the data analysis.

Chapter 4 contains the findings and the analysis of the data.

Chapter 5 includes a summary of the study with conclusions and recommendations.

CHAPTER 2

REVIEW OF RELATED LITERATURE

Introduction

The purpose of the literature review is to demonstrate the relationship between the study and previous work that considers the use and impact of e-mail. This chapter covers organizational communication considerations; theories of information technologies; the nature of e-mail; use of e-mail in business, higher education, and public education; as well as a summation.

Organizational Communication Considerations

Simply defined, communication is a process of transmitting meanings from a sender to a receiver (Hoy & Miskel, 1991). It is a two-way process that encompasses the sharing of thoughts, ideas, and feelings with both parties having commonly understandable ways (Pankake, Stewart, & Winn, 1990). Murphy (1991) contends that no "essential" definition of communication can be determined, only a working definition that describes the phenomena. This reservation is based upon attempts to define communication with words that already involve "communicative parts of their connotations" (p. 832).

Based upon the initial simple definition, Hodgetts (1984) noted that the communication process involves five essential elements within three functions. The first function deals with the sender (encoding process). The sender generates a message that is put into a form the receiver will understand. Next the message must be transmitted via an appropriate medium (channel). Those media could include the telephone, personal written text (letters, memos), formal written text (bulletins, directives), computer numerical output, e-mail, informal conversations, charts, diagrams, pictures, or figures (Schmitz & Fulk, 1991). The third function involves the receiver. In this decoding process the communication is received and interpreted by the receiver. To ensure the proper meaning of written and spoken communications during the decoding process, one must consider the language of the communication, the way the words are used (how fast the sender speaks or the tone of the message), and nonverbal messages that are sent intentionally or unintentionally. If multiple means were used to transmit the message, the impact of the message can be increased (Pankake, Stewart, & Winn, 1990). This could entail sending a written note and following up with a telephone call or a direct face-to-face meeting.

Communication processes have a direct impact upon the commitment of individuals to an organization. Communication is a major antecedent of organizational commitment. When the organization communicates to its workers its intentions and provides meaningful jobs in a positive learning environment, commitment to the organization and its goals and objectives are enhanced (Allen, 1992).

Allen (1992) studied the impact six communication variables have upon organizational commitment. The six variables were perceptions regarding the quality of information received from three communication sources and the quality of their communication relationship with each source. The three communication sources were top management, co-workers, and supervisors. It was found that top management-employee communication relationships and the quality of top management's information were strongly linked. Superior-subordinate communication was also very important. These variables were a strong predictor of

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organizational support. If an organization is facing a problematic environment, top management must provide employees with needed communication to ensure their support. In an organization that seeks employee involvement, communication provides the key for successful participation. The key players in an employee involved organization are the middle managers who provide the two-way communication (Gonring, 1991).

Communication processes play a role in organizational leadership. The leadership must realize that communication is essential. It is a measure of effective leadership (Lewellen, 1990; Pankake, Stewart, & Winn, 1990). Through communication, power relationships are created, maintained, and modified (Ray, 1993). Formal authority relationships can be enhanced by informal communication. When managers and subordinates communicate, stability and predictability to the formal leadership relationship can be strengthened (Waldron, 1991).

Communications is a trait or phenomena integral to the effectiveness of any organization (Zahn, 1991). Additionally, it is essential to the social processes of organizations. Berger(1991) states that communication has become so important to social processes that it has become a supra-discipline. Human groups and societies would not exist without communications (Schramm, 1963).

Complex structures, coordination devices, authority and status hierarchies, task specialization, interrelated roles, and conflicting requirements of control and autonomy, within an organizations are not only outcomes of the communication process but are also as powerful forces influencing the means through which individuals communicate. Communication skills that influence organizational dynamics are essential for organizational effectiveness. Communication processes provide the "building blocks" for numerous aspects of organizations, i.e. factors of leadership and organizational control (Redding, 1992). In industry, decision makers believe that communication in the organization makes the essential difference in increasing productivity. Further communication is the skill most critical to managerial performance and effectiveness (Papa & Graham, 1991). What is the theory base for this communication?

Theories of Information Technologies

New technologies are quickly impacting organizational communication processes. Information technologies (IT) have redefined organizational communication (Steinfield & Fulk, 1987). ITs, which are sometimes referred to as interactive communication technologies (ICTs), have the potential to alter organizational communication means, not just substitute for older ones (Lewis, 1991). Upon adopting ICTs, the organization might experience "changes in formal and informal communication networks, power relationships (in terms of access, control, resource dependency, and expertise), and information load and flow" (Lewis, 1991, p. 207).

As information technologies develop, the underlying theoretical base must be comprehended. The premise of the theory base for ITs lies in several theories. The two basic approaches are a traditional media characteristics perspective and a social information processing perspective. Both can be compared under three dimensions: (a) properties of the media--objective versus subjective, (b) saliency--difference in inherent features of media, and (c) media choice processes (Fulk, Steinfield, Schmitz, & Power, 1987). Properties of media in the media characteristic perspective (MCP) were objective while the social information perspective (SIP) were subjective. From the objective view, inherent, physical characteristics that all users could recognize exist. The subjective view identifies influences by attitudes and behaviors of others. Saliency for the MCP was a function of individuals' perceptions of media properties and task attributes, but for the SIP it was a function of co-workers and superiors' assessments. Media choice for the MCP was rationally based upon a congruence of media attributes with task requirements, whereas the rationale of the SIP was influenced by past statements, behaviors, and social norms.

From the fields of sociology and economics, Markus (1987) proposed a "critical mass" theory that was based upon the work of Oliver, Marwell, and Teixeira (1985). Oliver et al. defined critical mass as "a small segment of the population that chooses to make big contributions to the collective action while the majority do little or nothing" (p. 524). Markus extended this concept to explain diffusion of interactive media. Two points were made:

1. Universal access to ICT systems was seen as a public good that produced benefits to the entire organization no matter how many contributed in obtaining the good.

2. Initial users of the technology were influenced by later users and vice versa. The utility of electronic networks occurs when a critical mass of individuals is accessed by the system. Until enough individuals actively use e-mail, little motivation exists to use the system (Bull, Harris, Lloyd, & Short, 1989).

Thorn and Connolly (1987) extended the discussion of the public good to the study of data bases. Their research examined individuals disseminating known information to others in the organization. While Markus(1987) dealt with universal access as a public good where the benefit was the ability to communicate with someone, Thorn and Connally focused on the information and its value to others as a public good. Their experimental findings supported the basic premise that discretionary data was generally under-applied to the detriment of both individuals and organizations. Future refinement and development would be needed as the technology of storing and distributing information evolved.

Fulk et al. (1987) advocated the social information processing theory derived from sociology and social psychology. This perspective advocated that attitudes and behaviors are partly determined by information embedded in the social context. Social information influences use and underscores the complexity of tracing and assessing effects. Prior commitments and behaviors also partly influenced attitudes. Informational cues within the social environment determined appropriate attitudes and justifiable behavior. Their paradigm integrated social influences with traditional media use theory.

Likewise, Trevino, Lengel, and Daft (1987) integrated a social constructionist approach within the traditional media characteristics approach. In a study of 65 managers from 11 organizations, respondents were asked to provide reasons for selecting various communication media. The media included face-to-face, telephone, e-mail, and written form.

Content analysis revealed three factors that influenced the selection of media by managers. They included: (a) message ambiguity, (b) symbolic cues, and (c) situational determinants such as time and distance. In ambiguous situations face-to-face communications increased; however, in unambiguous situations, memos, letters, and e-mail were sufficient to impart the message. The medium selected connoted a symbolic meaning that transcended the explicit message. If an employee of long standing was congratulated upon attaining 30 years of organizational service with an e-mail message, the employee might interpret the media format as a sign of lack of caring. However, if e-mail or another emerging technology was used in a different situation, it could connote a high-tech scientific quality. Thus the media itself became a message.

Access to new technology such as e-mail was a significant predictor of use of it. Geographical dispersion could make it difficult to use face-to-face communications. Time pressures influenced media choice. If a manager were under time pressures, there would be less concern with message ambiguity in media selection. Davis, Bagozzi, and Warshaw (1989) furthered IT by using models from social psychology to a technology acceptance model (TAM). TAM was designed to explain computer use behavior. It provided a theoretical basis for linking perceived usefulness and ease of use with computer use behavior. A longitudinal study of 107 Master of Business Administration students was used to assess the causal linkages between these two constructs and computer use behavior. It was found that perceived usefulness was a major factor in computer use while perceived ease of use was a significant secondary factor. These theoretical considerations are apparent for investigating information technologies.

Nature of E-mail

Scholars of organizational communication are also interested in the manner in which media is used in organizations (Lewis, 1991). An emerging technology of interest is e-mail. In the literature e-mail was also referred to as computer based message systems (CAMS), interpersonal message systems (IMPS), and electronic messaging systems (EMS) (Crum, 1988).

E-mail transmits a message to a recipient's electronic address. The sender can send the message to a single address or simultaneously to multiple addresses. The receiver can read, save, or print a hard copy of the message, forward it to another address, combine with another message, or delete it (Sproull & Kiesler, 1991).

E-mail has four general properties. They include: (a) interactivity, (b) asynchronicity, (c) de-massification, and (d) social presence. Interactivity implies that the computer communication is more similar to having a conversation than reading a journal. An individual can "phone" another user that is on-line so that their interaction appears on respective screens as they type. Asynchronicity allows the user to send or receive messages at any convenient time. De-massification allows users to receive communication on an individual basis rather than in mass. The locus of control is from the sender to the receiver. The traditional social cues of face-to-face communication are missing, but the added features or capabilities of speed, memory capacity, privacy, media richness, ease of use, on-line directories and store-forward are available (Crumm, 1988; Lewis, 1991). "Electronic mail allows managers to instantly send messages across vast distances without playing telephone tag" (Trevino et al., 1987, p. 554).

What is the origin of e-mail? In 1969, the Advanced Research Projects Agency (ARPA), a part of the US Department of Defense, started development of a computer network known as ARPANet. The original intent was to connect different computers, using different operating systems that were too far apart to be connected by electrical wires. The underlying purpose was to link university scientists and other research institutions to support military research. In particular the system intended to build networks that could withstand outages from natural occurrences and bombing attacks and still function (Dern, 1994). Development of a means by which the researchers could communicate with one another was simply an aside. This minor and inconsequential addition was called e-mail and became one of the most popular features of the system. Ideas were exchanged spontaneously and casually between users without regard to physical locations (Sproull & Kiesler, 1991).

In 1983, ARPANet split into two separate networks. One part was for unclassified operational military activities and the other retained the original purpose (and name) of ARPANet. At the same time other networks emerged. One was BITNET. It stood for "**B**ecause **I**t's **T**ime" or "**B**ecause **I**t's **T**here" **NET**work. BITNET is still active as an international educational network.

Another outgrowth of ARPANET was the concept of internetworking. This concept involved connecting individual networks into larger units. This concept led to the network of networks called Internet. The entire process of developing ARPANet was a tremendous success and grew very rapidly and is still growing in Internet (Dern, 1994).

In a study of a Fortune 500 office equipment company, Sproull and Kiesler (1986) investigated the effects of e-mail to discover who had what information in the organization. The company employed over 100,000 people and had assets of over $7.5 billion and sales of over $8 billion in 1982. The impact of social context cues was assessed upon geographic location of others (place, distance, and time), organizational position of others (department, hierarchy, and job category), and situation (age, gender, relationships with others, and norms). Data collection was done in 1983 in the Research and Development and Business Products Divisions. These two divisions were the most extensive users of e-mail. Data were gathered through interviews, questionnaires, and content coding of actual e-mail messages. Internal characteristics of e-mail behavior were used to determine message attributes while perceived differences in behavior across the communication media was assessed using the questionnaire data. The message attributes and questionnaire responses were compared using correlated t-tests or repeated measures of analysis of variance. Results indicted that the use of e-mail diminished intra-organizational status differentials and had the potential to undermine formal organization authority relationships.

Patterns of information sharing had also changed. In a traditional organization, formal methods exist for distributing information. However, informal communication networks disseminated a large amount of information. Informal information was a function of the proximity and social acquaintances of the information provider. Distant or poorly connected individuals had less access to the information. E-mail and other electronic communications changed the dynamics. Electronically, any organization member could request a "Does anybody know?" message and receive information from anyone who sees it.

In a study of information inquiries on the network at Tandem Computer, Inc., in Cupertino, California, it was revealed that an average of six "Does anybody know?"

messages were sent daily over the company-wide distribution list. An average of eight Tandem employees responded to a question. Fewer than 15% who answered personally knew the questioner or were located in the same city (Sproull & Kiesler, 1991). If there was someone out there with whom to communicate, the system was used. Geographic isolation of workers was reduced.

In 1990 Senator Albert Gore introduced the National High Performance Act. This act was designed to create the National Research and Education Network (NREN) that would be a national network of information superhighways. Bishop (1990) noted that there would have to be several problems addressed before a national network could reach its full potential. These problems encompassed such issues as costs, guaranteed universal access, adequate user support and training, overcoming organizational resistance to formal and informal communications.

Maddux (1994) extended and amplified these problems to the educational prospects of the Internet. He noted such key issues as educational access; hardware and software availablity; costs of access; support; censorship; and quality control. Censorship referred to denying certain inappropriate materials to students. Maddux contended that censorship measures would not work because it is difficult to define what is acceptable or objectionable and the other is the technical problem of blocking information. "Any system of denying access to certain parts of the Internet can be defeated" (p. 40). Quality control referred to the ability to determine the quality of information discovered on the Internet.

With these understandings of the nature of e-mail, have business, higher education institutions, and public school systems connected to such networks to access e-mail? Have there been benefits gained from this access? The following sections will explore the use of e-mail by business, higher education institutions, and public school systems.

E-mail in Business

Corporations have realized the advantage of improving communication among employees and reducing costs by the elimination of paper flow. In business and industry, managers spend over 75% of their time communicating with others while office workers spend at least 60% of their time communicating with others. About one third of all office costs are in the preparation, duplication, handling, and storage of paper. The cost of a business letter varied between $8 - $50. To set up a meeting of eight people takes between 20-30 telephone calls (Seals et al., 1987). E-mail provided business and industry a fast, dependable way to transmit information plus served as an effective alternative to paper mail (Denton, 1992).

In 1982 about 30% of corporations indicated that telecommunication technologies were important. Within 10 years that figure jumped to 80% (King, 1992). The use of e-mail has grown phenomenally in the business community. Additionally, telecommunication technology made possible the implementation of innovative forms of organizational structures which could respond quickly to changing business requirements (Keen, 1987; Saraswat, 1991).

Media richness is the capacity of media to facilitate the exchange of information, understanding, and meaning. Schmitz and Fulk (1991) assessed the effects of media richness and social influence factors upon the use of e-mail. The media richness model of Trevino et al. (1987) was the basis of the investigation. In terms of media richness, face-to-face communication was most important followed by telephone, e-mail, personal written text, formal written text, and numerical computer printouts. Since e-mail was in the middle of the media richness rank order, it might be easier to determine individual variation in perceived information richness. This might lead to differences in media use if perceived richness was a powerful construct for predicting patterns of media selection.

Schmitz and Fulk (1991) found three individual differences that were relevant to e-mail use: (a) length of time using the media, (b) experience with computers, and (c) keyboarding skills. The social interaction of co-workers was investigated to determine how co-workers attitudes toward the usefulness of e-mail might influence attitudes of co-workers. A self-administered questionnaire was sent to 636 employees of a technically advanced research center of a large petrochemical corporation. Pre-survey interviews were used to identify key issues to be included in the study. Two weeks prior to the survey administration, the chief executive officer sent a memo to all employees informing them of the research, asking for their cooperation, and assuring confidentiality of their responses. During the survey administration, concurrent interviews were done to assist the researchers assess the candor of the respondents. The data were tested using maximum likelihood estimation procedures in PC LISREL 7.12.

Results indicated that the respecification of media richness as a perceptual variable has the potential to increase the exploration and predictive power for media in organizations. The coefficient of determination for perceived richness produced a value of 0.11 that is significant because the factor had been assumed to be relatively constant. Additionally, the two significant antecedents of e-mail richness perceptions were keyboarding skills and computer experience. Colleague use and supervisory attitudes of e-mail usefulness were factors that influenced use.

The atypical nature of the setting limited the generalizability of these results. The sample respondents were highly educated individuals who were involved in research tasks that the media richness model would distinguish as having high ambiguity. Additionally, the organization had a nine year history of e-mail use. However, due to the long use of e-mail, full access of the technology to all employees, a critical mass of regular users, and expert training and support, the validity of the findings was strengthened.

Paul Saffo, a fellow at the Institute of the Future in Menlo Park, has predicted that the Internet will redefine corporations of the future (Cronin, 1994). Hert (1994) argued that the critical success factor for capitalizing on the potential of the Internet in organizations will be training.

Based upon the literature findings, business and industry have committed to the implementation of e-mail to improve the effectiveness and efficiency of organizational communications. But what about the education sector?

E-mail in Higher Education

From the inception of e-mail in ARPANet, higher education institutions have been involved in electronic messaging. Rice and Case (1981) reported the results of a study on the implementation of e-mail at a large, private university. Questionnaires were disseminated and interviews conducted with 74 high level administrative users and 67 computer service personnel experienced in e-mail use. The data were analyzed by t-tests. The measures of frequency and duration of use were reliable across time, each correlating significantly and strongly (r=.67, .45 respectively; p's<.001). Neither correlated significantly with experience. Appropriateness of e-mail for various tasks associated significantly but weakly with use (frequency: r=.2, p<.06, n=60; duration: r=.24, p<.03, n=62). Overall the results supported the appropriateness of e-mail for administrative tasks. The relationship between reported use and benefits was strong; however, no changes occurred in these benefits over time.

Factor analysis revealed the existence of media styles that indicated either personality-related preferences or job-related preferences for different communication media. The implication was that e-mail acceptance will be affected by personality traits and media styles and ought to be associated with appropriate organizational tasks. Overall, e-mail had an impact but was less significant than what people attributed to it.

Lincoln (1992) conducted an ethnographic study to investigate whether or not e-mail had changed the work, communication patterns, and self-image of higher education faculty. In-depth open-ended interviews were conducted with six new e-mail user (four women and two men). The questions dealt with: (a) their use and frequency of use of e-mail; (b) the extent of use of on-line data services; (c) their means of learning the system (self-taught, formal classes, or tutorials); (d) differences in modes and substances of communication; (e) any changes in their circle of professional colleagues; (f) personal versus professional use of e-mail; and (g) changes in their self-image or feelings about themselves as they mastered this new technology. Data were placed on 3X5 cards, categorized into themes and categories of responses, and subjected to content analysis.

The study revealed that when users conversed regularly using e-mail, they formed groups that had appropriate intellectual exchange. This exchange between faculty members was more democratic and broader, especially for women. While this exchange engendered an informal and often humorous style of communication, the mastery of the technology had different influences on the users self-image.

E-mail has also impacted the higher education instructional process. Business education classes have included state of the art technology within their programs of study so that the students can pattern the use of technology in business work settings (Johnson & White, 1989; Seals et al., 1987). Amini (1993) studied the use of e-mail as a communication aid facilitator in a Management Information System (MIS) course at the University of Southern Mississippi. The course dealt with the socio-technical foundations of information systems, decision making, and information systems resource management. The students had no prior experience using e-mail. Several introductory sessions familiarized students with the main features of the university's e-mail system. Students were assigned the task of analyzing case studies which were taken from the course textbook. The analysis involved open-ended questions and illustrated various types of decision environments. Four work situations were used. The first involved an individual analysis of the case study with the written recommendations submitted to the instructor without the use of e-mail. The second entailed individual analysis but with the recommendations sent by e-mail. The third was a group analysis of the case study by four to five students with face-to-face communication with the group written recommendation presented to the instructor. The fourth setting was a group analysis utilizing e-mail and forwarding the group recommendations by e-mail. Based upon a review of the literature, a 5-point Likert-type scale survey questionnaire was designed to assess the outcomes of the four situations.

The survey assessed the following: (a) participants' preference ratings with and without e-mail, (b) the effectiveness of the system, (c) satisfaction with the system and the process, and (d) level of group consensus. Data were analyzed by t-tests.

Despite a user's high level of agreement over the importance of group interaction, consensus building was easier without e-mail with a majority of the students preferring to analyze the case studies through face-to-face contact. The students found e-mail a more effective medium for communicating on a one-to-one basis rather than for group interaction and communication.

The implication was that e-mail might be a better communication aid for individuals but less effective for group communications. In group task accomplishment situations, face-to-face communications were preferred. The experimenter did determine that a secondary benefit of e-mail use in the classroom was the facilitation of communication between the students and the instructor. These results were exploratory not confirmatory. Additional research would be needed to provide guidelines for such simulations using an electronic messaging system.

At Incarnate Word College and St. Mary's University, separated by a distance of ten miles, e-mail was used to allow students to exchange comments about paper written in an advanced composition class (Hall & Hall, 1991). The students were permitted to collaborate on the assignments. A survey was given to ascertain the affect of utilizing the technology in the course. Findings indicated that the technology was difficult to use initially; however, with experience the students were able to make the process work for them and increase the amount of collaboration. About three fourths of the students had positively changed their attitudes toward writing and use of technology. In reference to writing, it was indicated that the students focused more on writing style so that their writing would be better understood by a reader, revised their writing more, and became more comfortable and at ease as writers. In reference to the technology, they were more at ease with use and inclined to try other technology tools. The basic conclusion was that their possibilities for using the technology were enhanced.

In summary, e-mail use has benefitted higher education in many ways. It has encouraged and enhanced: (a) collegial relationships across distances, (b) information sharing, (c) faculty-student interactions, (d) less paperwork, (e) better access for faculty and students, (f) communications among common disciplinary interests, (g) personal relationships, and (h) development of interconnected e-mail networks to provide means to send and receive messages (Muffo & Snizek, 1987; Updegrove, Muffo, & Dunn, 1989). E-mail is "booming in colleges and universities" (Amoroso et al., 1993, p. 1). It offers the same possibility for public education.

E-mail in Public Education

In the first large scale national study of educators' use of telecommunications, Honey and Henriquez (1993) noted that while telecommunication practices have been accepted by other professional groups, educators are just beginning to use telecommunications in significant numbers. In 1993 e-mail was in an early stage of adoption in public education (Broholm, 1993). Even though it is in a state of infancy, e-mail has a great potential for educational purposes (Sivin-Kachala & Bialo, 1992). E-mail offers a useful medium for communication, collaboration, analysis, and movement of information from place to place (Flank & Livesey, 1993).

Several states have made commitments to provide statewide networks to implement information technologies. These commitments were made to improved the operation of the public school system.

TEnet is the Texas statewide computer network that was funded by the Texas state legislature. The system offers e-mail, on-line simulations, bulletin boards, collaboratively-built data bases, data base information, and access to Internet. For the first time, administrators wanted a computer on their desks and wanted to use it. By using the system, they increased their professional expertise in word processing, data base management, and spreadsheet applications. Time savings were attained in routine office tasks of memo writing, tracking maintenance records, processing work orders, and general personnel services.

Organizational communications became more effective and efficient (Stout, 1991).

In Florida, the Florida Information Resources Network (FIRN) was originally developed to network educational data that would reduce the data burden on teachers and administrators. It was designed to provide rapid and effective exchange of computerized information (Watson, 1986). In 1992, FIRN was extended to support K-12 instructional activities. It offered statewide e-mail; Internet e-mail; Cable in the Classroom, which is a listing of educational television available through public and commercial cable; career and post-secondary education information; conferencing for gifted students; and on-line support for home-bound and hospital-bound students (Sivin-Kachala & Bialo, 1992).

TEN is the Tennessee Educational Network. It is a cooperative venture between the State Board of Regents and the Tennessee State Department of Education. TEN's vision was to provide exposure and access to more knowledge and learning opportunities. TEN would provide all members of the educational community with equitable access regardless of geographical location or limited school resources. Its vision was to provide and expand learning opportunities, thus providing a means to restructure teaching and learning in Tennessee schools. TEN came on line in fall 1994 and provided e-mail and Internet access through regional network servers.

Virginia has two statewide networks. The Virginia Educational Research Network (VERNet) was developed for higher education use, and the Virginia Public Education Network (VAPEN) provided services for K-12 educators. VAPEN provided e-mail access, curriculum-based discussion groups, Internet access, NASA Space Link, News, student "chat," and study skills lessons (Bull et al., 1991; Sivin-Kachala & Bialo, 1992).

Disparity between educational resources available in rural and urban areas is an issue under review in Virginia. Beckner and Barker (1994) noted "problems in rural schools result from the limitations and disadvantages that are part of rural environments" (p. 7). The vast size of rural districts, low levels of family income, and general lack of financial resources are the biggest problems. The use of technology can lessen the impact of these disadvantages. Electronic resources are available regardless of geographic distance. Educators can collaborate via e-mail and have access to information resources. Discrepancies between remote rural systems with limited resources and urban systems with large information centers can be alleviated (Bull et al., 1991). Educators in any location can benefit from the collegiality, ease of use, lower costs, collaboration, as well as access to remote computers to share resources and information (Broholm, 1993; Huntington, 1995; Long, 1985; Sivin-Kachal & Bialo, 1992; Wishnietsky, 1991).

Conclusion

The literature reflected that e-mail has impacted organizational communications. While business and higher education communities have gleaned the benefits of e-mail, the potential of e-mail has just begun to impact public education. The speed, ease of use, cost savings, exchange of information, interactive collaboration, usefulness, reduced isolation, reduction in geographical distance between organizational entities, improved organizational efficiency and effectiveness, resource sharing, and less paperwork were some of the benefits of e-mail revealed by the literature. E-mail is an enabling technology that is providing an information highway system for all organizations (Keen, 1987).

CHAPTER 3

RESEARCH METHODOLOGY

The purpose of this chapter was to discuss the methods and procedures used to conduct a study of factors affecting the use of e-mail by public school principals of the central Appalachian Region. The following areas were included in this chapter: research design, population and sampling method, data collection, dependent variables, independent variables, and the data analysis.

Research Design

The research design for this study included both descriptive and correlational research methodologies. Descriptive studies primarily determine the way things are (Borg & Gall, 1989). Correlational research studies are attempts to describe the degree to which variables are related to and use relationships in making predictions (Borg & Gall, 1989; Gay, 1992). The use of descriptive and correlational research methodology was appropriate for answering the research questions and testing the hypotheses because data were collected by a survey instrument to determine differences and relationships.

A shortcoming of using these designs was that a cause-effect relationship cannot be established (Gay, 1992). The generalization of the results of this study was restricted to principals of the four states served by the Appalachian Educational Laboratory (AEL) located in Charleston, West Virginia.

Population and Sample Selection

The population consisted of all public school building level principals for the states served by the AEL including Tennessee, Virginia, West Virginia, and Kentucky. Approximately 5200 school principals are included in this region. A list of building level principals for all school districts of these four states was obtained from the data base maintained by the AEL.

It was not feasible to survey the entire population because of the population size (Gay, 1989). A stratified random sampling procedure was selected to sample the population. The number and percentage by state at the elementary, middle/junior high, and high school levels are indicated in Table 1. In the four states the percentage of elementary, middle/junior high, and high schools was 66.9, 17, and 17.1 respectively. The percentage of total schools in Kentucky (KY), Tennessee (TN), Virginia (VA), and West Virginia (WV) was 24.5, 28, 31, and 16.5 respectively. The stratified random sampling was based upon the percentage per state and within each respective state on the percentage at the elementary, middle/junior high, and high school levels.

TABLE 1

FREQUENCY (PERCENTAGES) OF SCHOOLS BY STATE AND EDUCATIONAL LEVEL

	Elementary	Middle/Jr. High	High	Total
KY	837 (65)	211 (17)	233 (18)	1281 (24.5)
TN	964 (67)	229 (16)	253 (17)	1446 (28)
VA	1094 (67)	265 (16)	269 (17)	1628 (31)
WV	594 (68)	132 (16)	137 (16)	863 (16.5)
Total	3489 (66.9)	837 (17)	892 (17.1)	5218(100)

To determine the appropriate sample size at a confidence level of 95% with a .05 degree of accuracy (+/-), the formula by Schaeffer, Mendenhall, and Ott (1986) was used. The sample size was determined to be 370. To ensure a 60% return rate, 620 principals were surveyed. The surveys were proportioned according to the percentages of Table 1. Table 2 indicated the survey distribution.

TABLE 2

SURVEY DISTRIBUTION NUMBER PER STATE AND EDUCATIONAL LEVEL

	Elementary	Middle/Jr. High	High	Total
KY	99	26	27	152
TN	116	28	30	174
VA	128	31	33	192
WV	70	16	16	102
Total	413	101	106	620

Instrumentation

Surveys are typically used to collect data. They provide the advantage of contacting a large number of subjects in geographical dispersed areas in a minimal time frame (Gay, 1992). Based upon the survey instruments of Amini (1993), Honey and Henriquez (1993), and especially Crum (1988), the initial survey instrument was developed. The survey instrument (see Appendix A) sought the following: (a) administrator's demographic information, (b) accessibility, (c) experience/training on computers and e-mail, (d) use of e-mail, and (e) items that influence the use or non-use of e-mail.

The survey was examined by a panel of experts to determine content validity. The panel consisted of Jackie Shrago, Vice Chancellor, Information Technologies, Tennessee Board of Regents, Nashville, Tennessee; Reed Sturdivant, Computer Services, East Tennessee State University, Johnson City, Tennessee; Craig Howley, Director, ERIC Clearinghouse on Rural Education and Small Schools, AEL, Charleston, West Virginia; Alan Rogers, Principal, Unicoi County Middle School, Erwin, Tennessee; Marilyn Webb, Principal, Oak View

Elementary School, Franklin, Tennessee; Ronnie Morton, Technology Coordinator, Elizabethton City Schools, Elizabethton, Tennessee; and Ann Kohler, Technology Coordinator, Lyman High School, Seminole County School District, Longwood, Florida. The selection of the panel of experts was based upon their expertise in e-mail use and training.

The panel suggested several changes to clarify questions. It was suggested that (a) grade level groupings be included in the "current principal question", (b) the choices for computer skill levels needed clarification, (c) redundant statements in the list of items that influence the use of e-mail be eliminated, and (d) the format of the survey be changed in places. Their suggestions were used to refine the survey instrument.

The instrument was pilot tested to determine reliability. A sample of 40 principals was given the revised survey. The internal consistency reliability, the degree that the survey consistently measures what it is intended to measure (Gay, 1992), was measured using Cronbach's coefficient alpha, the typical measure of internal consistency (DeVellis, 1991). Cronbach's coefficient alpha was 0.8686.

Data Collection

The survey instrument was mailed to 620 randomly selected principals with a cover letter explaining the purpose of the study along with a self-addressed stamped envelope for returning the completed survey. Follow-up mailings were sent two weeks after each request to encourage non-respondents to reply. Of the 620 mailed surveys, 396 were returned. Of that number 375 were usable for a response rate of 60.5%. Table 3 showed the number of returned surveys per state and educational level.

TABLE 3

NUMBER OF RETURNED SURVEYS BY STATE AND EDUCATIONAL LEVEL

	Elementary	Middle/Jr. High	High	Total
KY	61	15	16	92(24.5%)
TN	70	19	18	107(28.5%)
VA	77	18	20	115(30.7%)

TABLE 3 (continued)

	Elementary	Middle/Jr. High	High	Total
WV	41	10	10	61(16.3%)
Total	249(66.4%)	62(16.5%)	64(17.1%)	375(100%)

Dependent Variables

There were two dependent variables. The first one was e-mail use. The number of messages sent and received were combined to determine high, average, low, and non-users. The composite numbers were ranked with the top quartile assigned as high users, the 2nd and 3rd quartiles assigned as average users, and the bottom quartile assigned as low users. Non-users were those individuals who sent or received no messages. Attitudes toward the importance of each of 26 items that may or may not influence use of e-mail were measured by a Likert-type scale ranging from 1 for "none" to a value of 4 for "very important."

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Independent Variables

Demographic variables used in the study included gender, age, highest degree earned, total years experience in education, current job position, and years of experience as a principal. Accessibility was determined by availability of hardware and software at the work site and home. The method of financial access to e-mail was selected from a list of possible funding sources. Experience with computers and e-mail were measured by a Likert-type scale. The different modes of training in computers and e-mail were listed. Respondents selected primary and secondary means by which training was received. Pressure from superiors, fellow principals, and teachers was measured by a Likert-type scale with the values ranging from 1 for "none" to 4 for "a lot".

Data Analysis

Research questions were answered using descriptive statistics. The major types of descriptive statistics used were measures of central tendency, variability, and relative position (Gay, 1992).

Hypothesis testing was done with analysis of variance, multiple regression, and chi-square. The alpha level was set at .05. Data were analyzed using the computer statistical software program Statistical Package for the Social Science (SPSS) 6.1 for Windows. To use these parametric techniques, it was assumed that Likert-type scale scores met the criteria of ordered metric measurement (Festinger & Katz, 1953). Although Likert scale measurements do not strictly adhere to interval level data, ordered metric scale can be analyzed using parametric statistical procedures because ordered metric measurement approximates interval level measurement (Babbie, 1986). An error that might result was compensated by using more powerful statistical analysis (Kim, 1975).

Analysis of variance is an inferential technique used to determine the difference between multiple groups or variables (Howell, 1992). ANOVA resulted in the F-statistic that shows if the variables or groups were alike or different (Borg & Gall, 1989). ANOVA procedures were used with Hypotheses 2, 3, 4, 7, and 8.

Multiple regression is used to determine the relationship between multiple variables (Howell, 1992).

Because of its versatility and precision, it can be employed with data from any measurement scale. In addition to the relationship between variables, the degree of that relationship can be determined (Gay, 1992). Hypotheses 1, 5, and 6 were analyzed by the multiple regression technique.

Chi-square is a non-parametric test of difference when the data are in the form of frequency counts or categories (Borg & Gall, 1989). The ratio of observed to expected is compared. As the differences between observed and expected frequencies increase, the value of chi-square increases (Gay, 1992). Hypotheses 9 was analyzed with chi-square.

The 26 items that might or might not influence the use of e-mail were subjected to factor analysis. Factor analysis was used to provide a means to identify the number and nature of underlying concepts. Many variables can be reduced to a few factors that are moderately or highly correlated with each other (Kim & Mueller, 1978). Each group of correlated items form a factor that expresses "the common element that cuts across the combined variables" (Borg & Gall, 1989, p. 620). Thus, groups were identified that covary with each other and provide meaning to the underlying latent variables (DeVellis, 1991).

The first step of factor analysis was the creation of a correlation matrix. From this matrix, the principal components method for initial extraction of the factors was selected for analyzing the variance explained from the correlation matrix. Only those factors having an eigenvalue greater than one were subject to selection and rotation. Varimax and oblique rotations were conducted to make the factors more interpretable (Kim & Mueller, 1978).

Summary

In this chapter the research methodology followed in the study was presented. A descriptive and correlational study was undertaken using a sample of 620 public school principals from the four states served by the AEL. A survey instrument was developed, examined by a panel of experts, piloted with 40 administrators, and sent to the respondents. The dependent and independent variables were identified, and data from the surveys were tested by appropriate statistical techniques using Statistical Package for the Social Science (SPSS) 6.1 for Windows software.

CHAPTER 4

ANALYSIS OF DATA

This chapter presents the findings and the analysis of the data collected. The research questions and associated hypotheses are presented.

Research Questions and Hypothesis Testing

Research Question 1: What is the profile of a school principal who uses e-mail?

Of the 375 usable surveys, 59.7% of the respondents were e-mail users. A profile for both users and non-users was presented in Table 4. Users of e-mail were males (63.2%), with a mean age of 47.6 years, a masters + degree (61.4%), 23.5 total years experience, 7.1 years in the current position, and a total of 11.2 years experience as principal. Non-users of e-mail were males (65.8%), with a mean age of 47.1 years, a masters + degree (60.5%), 23.2 total years experience, 6.7 years in the current position, and a total of 9.7 years experience as principal.

TABLE 4

PROFILE OF USERS AND NON-USERS OF E-MAIL

	Users (n=223)	Non-Users (n=152)
	f (%)	f (%)
Gender		
Male	141 (63.2)	100 (65.8)
Female	82 (36.8)	52 (34.2)
Age		
Mean (yrs)	47.6	47.1
SD	6.1	8.0
Highest Degree		
Bachelor	3 (1.3)	2 (1.3)
Masters	26 (11.7)	31 (20.4)
Masters +	137 (61.4)	42 (60.5)
Educ. Specialist	28 (12.6)	13 (8.6)
Doctorate	29 (13.2)	14 (9.2)
Total Years Experience		
Mean (yrs)	23.5	23.2
SD	6.1	6.9

TABLE 4 (continued)

	Users (n=223)	Non-Users (n=152)
	f (%)	f (%)
Yrs. Current Position		
Mean (yrs)	7.1	6.7
SD	5.7	6.6
Total Yrs. Experience Principal		
Mean (yrs)	11.2	9.7
SD	7.2	7.6
Years Computer Experience		
Mean (yrs)	8.0	6.2
SD	4.1	4.3

Hypothesis 1: There is no relationship between use and gender, age, highest degree earned, and total years of experience. Hypothesis 1 was proposed to determine if there was a relationship between e-mail use and the demographics of gender, age, highest degree earned, and total years of

experience. Summary data for the best regression model were presented in Table 5. Less than 1% of the variance was explained. With F (4, 370) = .499 and p = .74 the null hypothesis was retained, indicating that there was no relationship between e-mail use and gender, age, highest degree earned, and total years of experience.

TABLE 5

SUMMARY OF MULTIPLE REGRESSION BETWEEN E-MAIL USE AND GENDER, AGE, HIGHEST DEGREE EARNED, AND TOTAL YEARS OF EXPERIENCE

Variable	B	SE B	Beta
Gender	160	.123	.069
Age	-.003	.013	-.020
Highest Degree	-.008	.018	-.025
Total Yrs. Experience	.006	.014	.038
(Constant)	.988	.506	

Note. R^2 = .005

F(4,370) = .499

p = .74

Research Question 2: Are there differences in e-mail use between elementary, middle, and high school principals?

Hypothesis 2: There is no difference in e-mail use between elementary, middle, and high school principals. Hypothesis 2 was formulated to determine if there was a difference between elementary, middle, and high school principals. Analysis of variance results were shown in Table 6. The analysis revealed that no difference existed in e-mail use between elementary, middle, and high school principals, F (2,372) = .134 and p = .874; therefore, the null hypothesis was retained.

TABLE 6

ANALYSIS OF VARIANCE OF E-MAIL USE BY CURRENT PRINCIPAL POSITION (N = 375)

Source of Variation	SS	df	MS	F	p
Main Effects	.339	2	.170	.134	.874
Current Position	.339	2	.170	.134	.874
Explained	.339	2	.170	.134	.874

TABLE 6 (continued)

Source of Variation	SS	df	MS	F	p
Residual	469.394	372	1.262		
Total	469.733	374	1.256		

Research Question 3: Are there differences in e-mail use by principals in Tennessee, Kentucky, Virginia, and West Virginia?

Hypothesis 3: There is no difference in e-mail use between principals of Tennessee, Kentucky, Virginia, and West Virginia. Hypothesis 3 was to determine any difference in use of e-mail between the principals of the four states surveyed. Analysis of variance results were presented in Table 7. The analysis presented in Table 7 revealed no differences existed in e-mail use by the principals of Tennessee, Kentucky, Virginia, and West Virginia. With F (3,371) and p = .786 the null hypothesis was retained.

TABLE 7

ANALYSIS OF VARIANCE OF E-MAIL USE BY THE PRINCIPALS IN TENNESSEE, KENTUCKY, VIRGINIA, AND WEST VIRGINIA (N = 375)

Source of Variation	SS	df	MS	F	p
Main Effects	1.343	3	.448	.355	.786
State	1.343	3	.448	.355	.786
Explained	1.343	3	.448	.355	.786
Residual	468.390	371	1.263		
Total	469.733	374	1.256		

Research Question 4: How does accessibility impact the use of e-mail?

Hypothesis 4: There is no difference between the level of use and accessibility to e-mail. Hypothesis 4 was formulated to analyze accessibility to e-mail and use. Accessibility could be attained at school or at home; therefore, both locations were tested. Table 8 presented the summary of the analysis of variance for access at school. Table 9 summarized the results of the chi-square analysis for accessibility at home. The analysis of variance revealed that there was a difference between e-mail accessibility at school and level of use, F(1,362) = 166.7 and p = .000. The chi-square results also revealed that there was a difference between e-mail accessibility at home and level of use, chi-square (1, N = 375) = 20.3, p = .000. In both analyses the null hypothesis was rejected.

TABLE 8

ANALYSIS OF VARIANCE OF E-MAIL USE IN SCHOOLS BY E-MAIL ACCESS IN SCHOOLS (N = 364)

Source of Variation	SS	df	MS	F	p
Main Effects	143.506	1	143.506	166.694	.000
E-mail Access	143.506	1	143.506	166.694	.000
Explained	143.506	1	143.506	166.694	.000
Residual	311.645	362	.861		
Total	455.151	363	1.254		

TABLE 9

SUMMARY OF CHI-SQUARE OF ACCESSIBILITY TO E-MAIL AT HOME BY LEVEL OF USE

Level of Use	Computer at Home		
	Yes	No	Total
Non-users	87	65	152
Users	176	47	223
Totals	263	112	375
Percentage	70.1	29.9	100

Note. Chi-square = 20.3, df = 1, p = .000

Research Question 5: What types of messages were sent and received using e-mail?

Four types of messages were sent or received. Administrative messages, announcements, and social messages were common to both the send and receive functions of e-mail use. The fourth type was indicative of the modality of the category. In the send category, the fourth type was a search or inquiry for information while in the receive category, it was an informational message. The percentage of types of messages sent and received are displayed in Tables 10 and 11 respectively. The bulk of administrative messages, announcements, and search requests were sent monthly or weekly. Thirty-six and four tenths percent of administrative messages were sent weekly; 35.9% of announcements were sent monthly; and 38.4% of searches were done monthly. Sixty-nine and five tenths percent of social messages were sent never or monthly with 43.7% of the respondents never using this type message. There was no clear pattern as to when messages were received. Seventy-one and three tenths percent of administrative messages were received weekly or daily with 39.2% received daily. Sixty-three percent of received announcements were obtained monthly or weekly with 36.9% received weekly. Sixty-six percent of received social messages were received never or monthly, similar to the frequency of sent social messages. Thirty-six and five tenths percent of the respondents never received social messages. Information messages were received monthly or weekly by 66.5% of respondents with

37.9% received weekly. Received information was more often obtained (weekly) than search messages sent (monthly).

TABLE 10

HOW OFTEN DIFFERENT TYPES OF MESSAGES ARE SENT BY PRINCIPALS

How Often	Admin. (n = 214)	Announcement (n = 206)	Social (n = 206)	Search (n = 211)
Never	23.8%	31.1%	43.7%	28.4%
Monthly	23.4%	35.9%	25.7%	38.4%
Weekly	36.4%	23.3%	23.3%	30.3%
Daily	16.4%	9.7%	7.3%	2.8%

Note. Admin. = Administrative

TABLE 11

HOW OFTEN DIFFERENT TYPES OF MESSAGES ARE RECEIVED BY PRINCIPALS

How Often	Admin. (n = 209)	Announcement (n = 203)	Social (n = 200)	Search (n = 203)
Never	12.9%	17.7%	36.5%	18.2%
Monthly	15.8%	26.1%	29.5%	28.6%
Weekly	32.1%	36.9%	27.0%	37.9%
Daily	39.2%	19.2%	7.0%	15.3%

Note. Admin. = Administrative

Research Question 6: Does the use of e-mail by superiors, fellow principals, or teachers influence the use of e-mail by the respondents?

Hypothesis 5: There is no relationship between a principal's use of e-mail and use by superiors, fellow principals, or teachers. Hypothesis 5 was formulated to determine if there was a relationship between a principal's e-mail use and use of e-mail by superiors, fellow principals, or teachers. Summary data for a multiple regression were presented in Table 12. One and five tenths percent of the variance was explained . With F(3,325) = 1.61 and p = .19, the null hypothesis was retained indicating no relationship between a principal's e-mail use and use of e-mail by a superior, fellow principal, or teachers.

TABLE 12

SUMMARY OF MULTIPLE REGRESSION BETWEEN E-MAIL USE BY A PRINCIPAL AND E-MAIL USE BY SUPERIORS, FELLOW PRINCIPALS, OR TEACHERS

Variable	B	SE B	Beta
Superior Use	.11	.11	.06
Fellow Principal Use	.10	.11	.05
Teacher Use	-.19	.10	-.10
(Constant)	1.35	.16	

Note. R^2 = .015

F(3,325) = 1.61

p = .19

Research Question 7: How was access to e-mail financed?

Seven funding sources for e-mail were proposed. They were personal, Parent Teacher Association or community donations, local funds, state funds, the federal government, grants, and other. A summary of the funding sources for e-mail users was given in Table 13. Ninety percent of the funding for e-mail was provided by local or state funding sources. The majority (50.8%) of e-mail use was financed by local funding.

TABLE 13

FUNDING SOURCES FOR E-MAIL USERS

Source	f	%
Personal	3	1.5
PTA/Donations	4	2.0
Local Funds	101	50.8
State Funds	78	39.2
Federal Funds	2	1.0
Grants	8	4.0
Other	3	1.5
Totals	199	100.0

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Research Question 8: By what means do respondents receive training in computers and e-mail?

There were 12 possible methods that respondents could select as their primary methods to receive training in computers and e-mail. Tables 14 and 15, respectively, summarize results of the primary computer and e-mail training methods of e-mail users.

The top six methods of receiving training in the use of computers and e-mail were the same. Self-teaching was the chief method for computer and e-mail training with 47.1% of respondents learning to use computers and 23.7% learning to use e-mail on their own. The next five preferred methods were local courses (17.9% for computers and 20.1% for e-mail), conferences/workshops (11.7% for computers and 17.8% for e-mail), spouse or friends (7.2% for computers and 11.0% for e-mail), colleagues (6.3% for computers and 11.0% for e-mail), and on-site consultants (3.6% for computers and 5.9% for e-mail).

TABLE 14

SUMMARY OF PRIMARY TRAINING METHODS OF COMPUTERS FOR E-MAIL USERS

Method	f	%	Cumulative %
Self-taught	105	47.1	47.1
Local courses	40	17.9	65.0
Conferences/workshops	26	11.7	76.7
Spouse or friends	16	7.2	83.9
Colleagues	14	6.3	90.2
On-site consultant	8	3.6	93.8
College courses	7	3.1	96.9
State educational courses	6	2.7	99.6
Simulation software	1	0.4	100.0
College Volunteer Mechanism	0	0.0	
Courses via network	0	0.0	
Video Training Tapes	0	0.0	

TABLE 15

SUMMARY OF PRIMARY E-MAIL TRAINING METHODS

Method	f	%	Cumulative %
Self-taught	52	23.7	23.7
Local courses	44	20.1	43.8
Conferences/workshops	39	17.8	61.6
Spouse or friends	24	11.0	72.6
Colleagues	24	11.0	83.6
On-site consultant	13	5.9	89.5
State education courses	12	5.5	95.0
College Volunteer Mechanism*	6	2.7	97.7
College courses	5	2.3	100.0
Courses via network	0	0.0	
Simulation software	0	0.0	
Video Training Tapes	0	0.0	

Note. * Tennessee Virtual School Project

Hypothesis 6: There is no relationship between e-mail training methods and the demographics of gender, age, and highest degree earned. To determine if there was a relationship between e-mail training methods and the demographics of gender, age, and highest degree earned, Hypothesis 6 was formulated. Summary data of the multiple regression analysis were presented in Table 16. About 1% of the variance was explained. With $F(3,268) = .82$ and $p = .48$ the null hypothesis was retained indicating that there was no relationship between e-mail training methods and the demographics of age, gender, and highest degree earned.

TABLE 16

SUMMARY OF MULTIPLE REGRESSION BETWEEN E-MAIL TRAINING METHODS AND AGE, GENDER, AND HIGHEST DEGREE EARNED

Variable	B	SE B	Beta
Age	-.01	.02	-.04
Gender	.30	.30	.06
Highest Degree	.03	.05	.04
(Constant)	3.76	1.26	

Note. $R^2 = .01$, $F(3,268) = .82$, $p = .48$

Hypothesis 7: There is no difference between use of e-mail and training methods for computers. Hypothesis 7 was proposed to determine if there was a difference between use of e-mail and computer training methods. An ANOVA was used to test the hypothesis. A summary of results was shown in Table 17. The analysis revealed that no difference existed between e-mail use and computer training methods, F(8,360) = 1.86 with p = .07; therefore, the null hypothesis was retained.

Hypothesis 8: There is no difference between use of e-mail and e-mail training methods. Hypothesis 8 was proposed to determine if there was a difference between e-mail use and e-mail training methods. A summary of the ANOVA results was presented in Table 18. The analysis revealed that there was no difference between e-mail use and e-mail traing methods, F(8,263) = 1.40 with p = .20, thus the null hypothesis was retained.

TABLE 17

ANALYSIS OF VARIANCE OF E-MAIL USE BY COMPUTER TRAINING METHODS

Source of Variation	SS	df	MS	F	p
Main Effects	18.26	8	2.28	1.86	.07
Computer Trng. Methods	18.26	8	2.28	1.86	.07
Explained	18.26	8	2.28	1.86	.07
Residual	443.08	360	1.23		
Total	461.339	368	1.254		

TABLE 18

ANALYSIS OF VARIANCE OF E-MAIL USE BY E-MAIL TRAINING METHODS

Source of Variation	SS	df	MS	F	p
Main Effects	11.58	8	1.45	1.40	.20
E-mail Trng. Methods	11.58	8	1.45	1.40	.20
Explained	11.58	8	1.45	1.40	.20
Residual	272.30	263	1.04		
Total	283.88	271	1.05		

Research Question 9: Does the respondent's level of keyboard skills influence the use of e-mail?

Hypothesis 9: There is no difference between the level of use of e-mail and keyboarding skills. Hypothesis 9 was formulated to test if there was a difference between use level of e-mail and keyboarding skills. Table 19 summarized the results of the chi-square analysis. The results indicate that there was no difference between the level of use and level of keyboarding skills. With chi-square (12, N = 346) = 15.4, p = .22, the null hypothesis was retained.

TABLE 19

SUMMARY OF CHI-SQUARE OF KEYBOARDING SKILL LEVELS BY E-MAIL USE

Skill Level	Level of Use				
	None	Low	Average	High	Total
Poor	20	4	11	5	40(11.6%)
Fair	21	10	12	7	50(14.5%)

TABLE 19 (continued)

Skill Level	Level of Use				
	None	Low	Average	High	Total
Average	44	12	22	12	90(26.0%)
Above Average	33	14	34	13	94(27.2%)
Proficient	19	15	22	16	72(20.8%)
Totals	137	55	101	53	346(100%)
Percentage	39.6	15.9	29.2	15.3	

Note. Chi-square = 15.4, df = 12, _p_ = .22

Research Question 10: Does computer experience influence the use of e-mail?

Table 4 indicated that the users of e-mail had a mean of 8.0 years of computer experience while non-users had a mean of 6.2 years. Computer experience could be gauged by the variable years of computer experience or computer skill level. Table 20 presents a summary of respondents computer skill level by level of use.

TABLE 20

SUMMARY OF COMPUTER SKILL LEVEL BY LEVEL OF E-MAIL USE

Skill Level	Level of Use				
	None	Low	Average	High	Total
Poor	21	4	2	5	32(8.6%)
Fair	52	15	22	15	104(28.0%)
Average	46	34	46	13	139(37.5%)
Above Average	24	8	19	16	67(18.1%)
Proficient	5	1	16	7	29(7.8%)
Totals	148	62	105	56	371(100%)
Percentage	39.9	16.7	28.3	15.1	

Hypothesis 10: There is no relationship between e-mail use and computer experience. Hypothesis 10 was formulated

to determine if there was a relationship between e-mail use and computer experience. Tables 21 and 22 presented summary data for the multiple regression analysis for years of computer experience and computer skill level respectively. For years of computer experience about 3% of the variance was explained. With $F(1, 326) = 10.3$ and $p = .00$, the null hypothesis was rejected. For computer skill level about 6% of the variance was explained. Similarly, when the computer skill level was the variable, the null hypothesis was rejected with $F(1,369)$ and $p = .00$. Both analyses indicated that there was a relationship between e-mail use and computer experience whether the computer experience was measured as years of computer experience or computer skill level.

TABLE 21

SUMMARY OF MULTIPLE REGRESSION BETWEEN E-MAIL USE AND YEARS OF COMPUTER EXPERIENCE

Variable	B	SE B	Beta
Yrs. Computer Experience	.05	.01	.18

TABLE 21 (continued)

Variable	B	SE B	Beta
(Constant)	.90	.12	

Note. R^2 = .03

$F(1,326) = 10.3$

$p = .00$

TABLE 22

SUMMARY OF MULTIPLE REGRESSION BETWEEN E-MAIL USE AND COMPUTER SKILL LEVEL

Variable	B	SE B	Beta
Computer Skill Level	.05	.01	.18
(Constant)	.90	.12	

Note. R^2 = .03

$F(1,326) = 10.3$

$p = .00$

Research Question 11: What are the factors that may or may not influence the use of e-mail?

A major purpose of the study was to determine the factors that influence the use of e-mail by public school principals. Attitudes toward each of 26 items that may or may not influence the use of e-mail was measured by a Likert-type scale ranging from 1 for "none" to a value of 4 for "very important." These 26 items were analyzed by factor analysis to determine the number and nature of underlying concepts for use and non-use of e-mail.

The principal components method for initial extraction of factors was used. Only those principal component factors having an eigenvalue of 1 or more were subject to selection and varimax rotation. Additional factor analysis was conducted to obtain a final factor solution. The final factor solution selected would account for as much of the total variance as possible, have factor loadings of .40 or higher, result in interpretable factors, and share communality.

E-mail Users Factor Analysis

The data for users of e-mail was initially factored using SPSS for Windows statistical software package without a specified number of factors determined. The statistical software program extracted seven initial factors with the varimax rotation converging in seven iterations and accounting for 61.9% of the variance for users of e-mail. To determine the final factor solution, additional factor analysis was conducted specifying a four-, five-, and six-factor solution. All three varimax rotations converged in six iterations.

The four-factor solution was selected as the optimal factor solution because it accounted for 48.6% of the variance, all four factors were interpretable, and all aspects of the other factor solutions could be identified within the four factor solution. Table 23 contained the eigenvalues and percentages of explained variance for the four-factor solution for users of e-mail.

TABLE 23

EIGENVALUES AND PERCENTAGES OF VARIANCE EXPLAINED BY FOUR-FACTOR SOLUTION FOR E-MAIL USERS

Factor	Eigenvalue	% of Variance	Cumulative % of Variance
1	6.438	24.8	24.8
2	2.557	9.8	34.6
3	2.061	7.9	42.5
4	1.590	6.1	48.6

Table 24 summarized the rotated pattern matrix for the four-factor solution.

TABLE 24

VARIMAX ROTATED PATTERN MATRIX FROM E-MAIL USERS FACTOR ANALYSIS

Item	Factor 1	Factor 2	Factor 3	Factor 4
45	.18609	.65658	-.06243	.09642
46	.17317	.32406	-.10922	.50892
47	.16770	.21201	.05758	.49593
48	.05471	.45333	.12543	.21826
49	.18044	.65946	-.00609	-.26592
50	.00264	.77506	.03906	-.00838
51	.14128	.60527	.19016	.12280
52	-.23546	-.16971	.03157	.56889
53	.16881	.11061	.15477	.52315
54	.28199	.33584	.23618	.35573
55	.23803	.13264	.19605	.68654
56	.20490	.09966	.38727	.40890
57	.07331	-.25306	-.01841	.56724
58	.39639	.47472	.28190	-.25248
59	.16867	.42459	.22937	.16653
60	.50612	.35978	.22121	-.27327

TABLE 24 (continued)

Item	Factor 1	Factor 2	Factor 3	Factor 4
61	.20782	.16247	.53698	.04704
62	.64733	.00363	.14555	.17205
63	.74636	.28204	.11531	.20012
64	.75195	.29749	.08371	.21870
65	.69465	.04091	.03120	.18534
66	.71609	.16220	.14150	.11120
67	.45461	.08376	.49133	-.14426
68	.09771	.05423	.78269	.03962
69	.07155	.04177	.84023	.07426
70	.01033	.08263	.77114	.23600

E-mail Users Factor 1 - Availability of Resources

Factor 1 contained seven items loading at least .40 and accounting for 24.8% of the variance. Items 60, 62, 63, 64, 65, 66, and 67 loaded on Factor 1. Table 25 presented the items in an abbreviated form. Factor 1 was labeled Availability of Resources.

E-mail Users Factor 2 - Technicalities of E-mail

Factor 2 contained seven items loading at least .40 and accounting for 9.8% of the variance. Items 45, 48, 49, 50, 51, 58, and 59 loaded on Factor 2. Table 26 presented the items in an abbreviated form. Factor 2 was the Technicalities of E-mail.

E-mail Users Factor 3 - Encouragement

Factor 3 contained five items loading at least .40 and accounting for 7.9% of the variance. Items 61, 67, 68, 69, and 70 loaded on Factor 3. Table 27 presented the items in an abbreviated form. Factor 3 was labeled Encouragement.

E-mail Users Factor 4 - Barriers to Use of E-mail

Factor 4 contained seven items loading at least .40 and accounting for 6.1% of the variance. Items 46, 47, 52, 53, 55, 56, and 57 loaded on Factor 4. Table 28 presented the items in an abbreviated form. Factor 4 was Barriers to Use of E-mail.

TABLE 25

CHARACTERISTICS OF E-MAIL USERS FACTOR 1 - AVAILABILITY OF RESOURCES

No.	Item	Factor Loading
60	Received info important to job	.506
62	Training received on e-mail	.647
63	Access to computer hardware	.746
64	Access to appropriate software	.752
65	Availability of a consultant	.695
66	Ability to learn e-mail system	.716
67	Encouragement to use e-mail	.455

TABLE 26

CHARACTERISTICS OF E-MAIL USERS FACTOR 2 - TECHNICALITIES OF E-MAIL

No.	Item	Factor Loading
45	Comfort with using computers	.657
48	Individuals with whom to communicate	.453
49	Effective communication aid	.659
50	Speed of communication	.775
51	Length of e-mail messages	.605
58	Productivity with e-mail	.475
59	Proficiency of typing skills	.425

TABLE 27

CHARACTERISTICS OF E-MAIL USERS FACTOR 3 - ENCOURAGEMENT

No.	Item	Factor Loading
61	Enhances prestige	.537
67	Encouragement to use e-mail	.491
68	Pressure by superiors	.783
69	Pressure by fellow principals	.840
70	Pressure by teachers	.771

TABLE 28

CHARACTERISTICS OF E-MAIL USERS FACTOR 4 - BARRIERS TO USE OF E-MAIL

No.	Item	Factor Loading
46	Software difficult to understand	.509
47	Trouble with phone lines	.496
52	Prefer to use telephone/letters	.569
53	Cost of e-mail system	.523

TABLE 28 (continued)

No.	Item	Factor Loading
55	Insufficient computer training	.687
56	Fear of making spell/grammar error	.409
57	Higher priority of other duties	.567

Non-users of E-mail Factor Analysis

The data for non-users of e-mail were initially factored using SPSS for Windows Statistical Software Package without a specified number of factors determined. The statistical package extracted eight initial factors with the varimax rotation converging in 11 iterations and accounting for 71.4& of the variance. Additional factor analysis was conducted specifying a four-, five-, and six-factor solution. The varimax rotations converged in 6 iterations for the four-factor solution and 11 for the five-factor solution but failed to converge in 25 iteration for the six-factor solution.

The five-factor solution was selected as the optimal factor solution because it accounted for 59.4% of the variance, all five factors were interpretable, and aspects of the other factor solutions could be identified within the five-factor solution. Table 29 contained the eigenvalues and percentage of explained variance for the five-factor solution for non-users of e-mail.

TABLE 29

EIGENVALUES AND PERCENTAGES OF VARIANCE EXPLAINED BY THE FIVE-FACTOR SOLUTION FOR NON-USERS OF E-MAIL

Factor	Eigenvalue	% of Variance	Cumulative % of Variance
1	7.569	29.1	29.1
2	2.730	10.5	39.6
3	1.971	7.6	47.2
4	1.851	7.1	54.3
5	1.324	5.1	59.4

Table 30 summarized the rotated pattern matrix for the five-factor solution.

TABLE 30

VARIMAX ROTATED PATTERN MATRIX FROM NON-USERS OF E-MAIL FACTOR ANALYSIS

Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
45	.65349	.12381	.29766	.01024	-.00442
46	.70173	.03019	.13871	.20671	-.05192
47	.00170	-.09591	.41043	.14521	.14253
48	.51557	.04084	.53504	.07790	.15399
49	.54486	.14249	.68490	-.07815	-.00713
50	.51880	.01865	.66141	-.02212	.01204
51	.04609	.15404	.75301	.05456	-.02502
52	.06547	-.38343	.01709	.08375	.71495
53	-.08621	.23777	.43747	.16780	.45365
54	.61105	.34862	.16961	.10665	.19938
55	.51924	.36681	-.06098	.08490	.39526
56	.18361	.30782	.14006	-.09278	.50847
57	.18651	.14897	-.00308	.09196	.65912
58	.16454	.39242	.69628	.18342	-.05309
59	.65020	.10756	.08917	.02061	.25477
60	.17511	.49650	.55620	-.02181	.01391

TABLE 30 (continued)

Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
61	.21523	.33390	.27659	.16247	.12050
62	-.02117	.75399	.20466	.11795	.02325
63	.29296	.71946	.06362	.09813	.11364
64	.25294	.78833	.10250	.04429	.10414
65	.59511	.37446	-.03401	.01830	.20939
66	.53505	.55839	.09133	.01148	-.03506
67	.18212	.38563	-.01847	.53538	-.11698
68	.09131	.01175	.14106	.87949	.02085
69	.03622	.04351	.08363	.93758	.11679
70	.03469	.07578	.11565	.91069	.12659

Non-users of E-mail Factor 1 - Comfortableness

Factor 1 contained 10 items loading at least .40 and accounting for 29.1% of the variance. Items 45, 46, 48, 49, 50, 54, 55, 59, 65, and 66 loaded on Factor 1. Table 31 presented the items in an abbreviated form. Factor 1 was labeled Comfortableness.

Non-users of E-mail Factor 2 - Availability of Resources

Factor 2 contained five items loading at least .40 and accounting for 10.5% of the variance. Items 60, 62, 63, 64, and 66 loaded on Factor 2. Table 32 presented the items in an abbreviated form. Factor 2 was labeled Availability of Resources.

Non-users of E-mail Factor 3 - Technicalities of E-mail

Factor 3 contained eight items loading at least .40 and accounting for 7.6% of the variance. Items 47, 48, 49, 50, 51, 53, 58, and 60 loaded on Factor 3. Table 33 presented the items in an abbreviated form. Factor 3 was labeled Technicalities of E-mail.

Non-users of E-mail Factor 4 - Encouragement

Factor 4 contained four items loading at least .40 and accounting for 7.1% of the variance. Items 67, 68, 69, and 70 loaded on Factor 4. Table 34 presented the items in an abbreviated form. Factor 4 was labeled Encouragement.

Non-users of E-mail Factor 5 - Barriers to Use

Factor 5 contained five items of which four loaded at least .40 and accounting for 5.1% of the variance. Items 52, 53, 55, 56, and 57 loaded on Factor 5. Table 35 presented the items in an abbreviated form. Factor 5 was labeled Barriers to Use.

TABLE 31

CHARACTERISTICS OF NON-USERS OF E-MAIL FACTOR 1 - COMFORTABLENESS

No.	Item	Factor Loading
45	Comfort using computers	.653
46	Software difficult to understand	.702
48	Individuals with whom to communicate	.516
49	Effective communication aid	.545
50	Speed of Communication	.519
54	Training from friend/colleague	.611
55	Insufficient computer training	.519
59	Typing proficiency	.650
65	Availability of consultant	.595

TABLE 31 (CONTINUED)

No.	Item	Factor Loading
66	Ability to learn e-mail system	.535

TABLE 32

CHARACTERISTICS OF NON-USERS OF E-MAIL FACTOR 2 - AVAILABILITY OF RESOURCES

No.	Item	Factor Loading
60	Received info important to job	.497
62	Training received in e-mail	.754
63	Access to computer hardware	.719
64	Access to appropriate software	.788
66	Ability to learn e-mail system	.558

TABLE 33

CHARACTERISTICS OF NON-USERS OF E-MAIL FACTOR 3 - TECHNICALITIES OF E-MAIL

No.	Item	Factor Loading
47	Trouble with phone lines	.410
48	Individuals with whom to communicate	.535
49	Effective communication aid	.685
50	Speed of communication	.661
51	Length of e-mail messages	.753
53	Cost of e-mail system	.437
58	Productivity with e-mail	.696
60	Receive info. important to job	.556

TABLE 34

CHARACTERISTICS OF NON-USERS OF E-MAIL FACTOR 4 - ENCOURAGEMENT

No.	Item	Factor Loading
67	Encouragement to use e-mail	.535
68	Pressure by superiors	.879
69	Pressure by fellow principals	.938
70	Pressure by teachers	.911

TABLE 35

CHARACTERISTICS OF NON-USERS OF E-MAIL FACTOR 5 - BARRIERS TO USE

No.	Item	Factor Loading
52	Prefer to use phone/letters	.715
53	Cost of e-mail system	.454
55	Insufficient computertraining	.395*
56	Fear of making spelling/grammar error	.508
57	Higher priority of other duties	.649

Note. * loading less than .40

Summary

The 11 research questions and 10 hypotheses were discussed. At the .05 level of significance eight null hypotheses were retained, and two rejected. Factor analysis identified four factors for e-mail users and five factors for non-users of e-mail. The primary predictors of e-mail use were computer experience, accessibility to resources, and training.

CHAPTER 5

SUMMARY, FINDINGS, CONCLUSIONS, RECOMMENDATIONS, AND IMPLICATIONS

Results of the study of the use or non-use of e-mail by principals of the Central Appalachian Region have been presented. A summary of the study, findings, conclusions, recommendations, and implications based on the review of literature and analysis of data are presented in this chapter.

Summary

E-mail has provided a new means of communication that has been implemented in many organizations throughout the world (Hawley, 1996). E-mail's full impact has not been established in the educational community (Zahn, 1991). In the school setting the use of e-mail has the potential to impact school leadership and organizational structure (Pedras & Horton, 1996; Ryder & Wilson, 1996). The purpose of this study was to determine those factors that impact the use of e-mail by public school principals, the purposes for which e-mail messages were sent and received, and the impact of experience and training in computers and e-mail on use. In the study 11 research questions were addressed along with 10 formulated hypotheses. The hypotheses were tested at the .05 level of significance.

Elementary, middle/junior high, and high school principals from Tennessee, Virginia, Kentucky, and West Virginia were selected to partcipate using a stratified random sampling technique. The survey instrument was mailed to 620 randomly selected principals. Of the 396 returned surveys, 375 were usable. The data were analyzed using the SPSS for Windows Statistical Software Package.

Discussion of Findings

Honey and Henriquez (1993) conducted a national telecommunication technology survey with K-12 educators. They found that sending e-mail was the most common use of the Internet; however, the use of the Internet was not widespread in the educational community. This study found that 59.7% of principals from the Central Appalachian Region were e-mail users indicating that a higher percentage of principals used e-mail than had been previously presented or perceived.

The demographics for e-mail users of age, gender, highest degree earned, and total years of experience presented in Table 4 were similar to Honey and Henriquez's 1993 national survey. A national survey and study by Schmitz and Fulk (1991) imply that more highly educated and older individuals would be more likely to use e-mail. It is perceived that there should be demographic differences between users and non-users of e-mail; however, this study does not support that belief. Less than 1% of variance was explained. No relationship was located among the level of e-mail use and the demographics of age, gender, highest degree earned, and total years of experience.

Computer experience was one variable that did indicate a difference between users and non-users. The mean number of years for e-mail users was 8.0 and 6.2 for non-users. The relationship between computer experience and the level of use was examined. About 3% of the variance was explained by years of computer experience while 6% of the variance was explained by computer skill level. Both years of computer experience and computer skill level were significant indicators at the .05 level; therefore, the null hypothesis was rejected. These results are consistent with the work of

Honey and Henriquez (1993), Lincoln (1992), Hall and Hall (1991), and Schmitz and Fulk (1991).

E-mail use between elementary, middle/junior high, and high school principals was examined. Results indicated that there were no difference in e-mail use between the three educational levels.

Virginia started establishing an electronic community connecting 137 school districts in 1991 (Bull, Hill, Guyre, & Sigmon, 1991) and completed the connections in 1992 (Sivin-Kachala & Bialo, 1992). The other three states started later than Virginia. The conclusion might be drawn that Virginia principals would use e-mail more extensively because they had more experience with e-mail. No difference in e-mail use was found between the principals of the four states.

One purpose of the study was to determine the purposes for principals sending and receiving e-mail messages. Principals primarily use e-mail for administrative messages and announcements. Rice and Case (1981) determined that e-mail was an appropriate vehicle for administrative tasks. A secondary use is accessing and retrieving information. When useful information is obtained, acceptance of the technology is enhanced (Davis, Bagozzi, & Warshaw, 1989; Schmitz & Fulk, 1991).

Honey and Henriquez (1993) indicated that the primary financial support for telecommunications activities came from local and state funding. Those results are consistent with the findings of this study. In the Central Appalachian Region, 90% of the funding was from local and state sources.

Access to e-mail is a necessary prerequisite to its use. Bishop (1990), Maddux (1994), and Trevino et al. (1987) made that point. Trevino et al. contend that access was a significant predictor of use. The findings of this study are consistent with these works. The study found that accessibility to e-mail at school or the availability of a computer at home were indicators of e-mail use.

Another finding dealt with the issue of the organizational infrastructure variable of pressure and use of e-mail by superiors, fellow principals, or teachers. Use of e-mail by superiors, fellow principals, and teachers did not influence respndent's use of e-mail. The findings are in contradiction to those of Schmitz and Fulk (1991). Their findings indicated that use by co-workers and supervisors led to fellow workers use of e-mail. The different finding could be attributed to the nature of the large research and development organization studied by Schmitz and Fulk, or the isolation of principals from superiors and peer principals.

Davis et al. (1989) and Hert (1994) indicated that training was essential to effective implementation and use of telecommunciation activities. This study generated several findings in regard to training. Primary methods for gaining computer and e-mail skills were through self teaching, local courses, conferences/workshops, spouse or friends, colleagues, and on-site consultants. These results are consistent with the national survey by Honey and Henriquez (1993). The main training method for both computers and e-mail was self-teaching; however, a greater percentage of respondents were self-taught in computers than in e-mail. The top six methods to gain computer expertise ranged from a high of 47.1% for self-teaching to 3.6% for on-site consultants. For e-mail training methods, the range was from 23.7% for self-teaching to 5.9% for on-site consultants. Few principals receive their training through higher education institutions - 3.1% for computer training and 2.3% for e-mail. No principal used courses via networks or video training tapes.

The study found no relationship between e-mail training methods and the demographics of gender, age, and highest degree earned. There was also no difference between e-mail use and training methods for computers or e-mail.

Schmitz and Fulk (1991) found that e-mail use was linked to keyboarding skills. Their survey and interview findings indicated that some individuals rarely used e-mail because "your English and spelling skills are out there for everyone to see" (pp 510-511) or "it is difficult to use electronic mail without typing skills" (p 513). Findings of this study indicate no difference between the level of use of e-mail and keyboarding skills. Crum (1988) similarly found that keyboard skills were not an important indicator of e-mail use.

The primary purpose of the study was to determine the factors that influence the use of e-mail by principals. Through factor analysis four factors were found that affect users use of e-mail while five factors were determined to affect non-users of e-mail. Both users and non-users shared four factors. They were availability of resources, technicalities of e-mail such as effective communication aid, speed of communication, and length of e-mail messages, encouragement, and barriers to the use of e-mail such as preference to use traditional communication media like telephones and letters, cost of e-mail systems, insufficient computer training, fear of making spelling/grammar mistakes, and higher priority of other duties.

For users of e-mail, availability of resources such as access to computer hardware and software, availability of a consultant, ability to learn the e-mail system, and training were the main factors. This factor confirmed the findings of Bishop (1990), Davis et al. (1989), Hert (1994), Maddux (1994), and Trevino et al. (1987).

In contrast, comfortableness was the main factor for non-users of e-mail. Comfortableness included such items as difficulty of software to learn, insufficient computer training, typing proficiency, and ability to learn the e-mail system.

Comfortableness is related to computer experience. Confidence in the use of technology is enhanced with experience (Russell, 1996; Wilson, Ryder, McCahan, & Sherry, 1996). The impact of computer experience was a factor in predicting e-mail use. Whether measured in years of experience or computer skill level, there was a relationship between computer experience and use. As principals become comfortable with using technology, they are more likely to use it. Davis et al. (1989) indicated that perceived usefulness of technology engenders acceptance and use. Sproull and Kiesler (1991) noted that when there is someone with whom to communicate, e-mail systems are used. E-mail users see that e-mail is an emerging means to exchange information within the educational community.

E-mail users have available access to computer hardware and software at school and home, sufficient training on the e-mail system, support, and organizational encouragement to use e-mail. These items enhance the use of e-mail and are supported by the findings of Hert (1994), Maddux (1994), Schmitz and Fulk (1991), and Trevino et al. (1987).

Conclusions

As a result of the findings, the following conclusions were drawn concerning the factors that affect the use of e-mail by principals of the Central Appalachian Region.

1. E-mail is being used by a greater percentage of principals of the Central Appalachian Region than previously reported or perceived.

2. There is no difference in the demographics of age, gender, highest degree earned, and total years of educational experience between users and non-users of e-mail.

3. Wider training options are available for gaining e-mail skills than for computer skills.

4. The primary predictors of e-mail use include previous computer experience, accessibility to resources, and training.

5. Personality traits and communication style preferences affect the use and acceptance of e-mail.

6. Most funding for e-mail is provided by local or state sources.

7. Use of e-mail by superiors, fellow principals, or teachers does not seem to affect e-mail use by principals.

8. Principals primarily use e-mail for administrative tasks and functions. Accessing and retrieving information is a secondary use of e-mail.

Recommendations

As a result of this study, the following recommendations are made.

1. This study should be replicated to determine if the factors that influence the use or non-use of e-mail change as the technology becomes more widespread.

2. This study should be expanded to determine factors that affect the use of e-mail by district level administrators and superintendents/directors of schools.

3. Additional studies need to be made to determine the impact of personality traits and communication style preferences on e-mail use.

4. The impact of increased funding and new telecommunication initiatives by the federal government should be studied.

5. Training sessions in e-mail use and other telecommunication activities should be structured to cover both theory and basic "hands on" training experience to capitalize upon e-mail's usefulness to the educational community.

6. After learning how to use e-mail, support services need to be made available to sustain and increase expertise in e-mail use. Support services should include technical support that maintains the operational integrity and user friendliness of the e-mail system, moral support that builds

confidence and lessens anxiety toward the technology, and functional support that produces educationally appropriate uses and benefits.

7. E-mail has been used for administrative functions, but other potential beneficial uses need to be explored. Some other potential uses include remote databases, bulletin boards, and listservs.

Implications

E-mail was originally added as an afterthought or unnecessary peripheral to ARPANET. It became the most powerful and useful feature of the system. It became a means for individuals to communicate with each other. E-mail has become one of the navigational tools for the information age. Business and higher education have realized the importance of e-mail use to achieve flexibility, effectiveness, and efficiency in their organizations. If principals are to be effective in this information age, they must recognize the potential ramifications of e-mail upon the educational environment. As the instructional leaders of their schools, principals must be cognizant of e-mail's capabilities within the learning environment and become the role models for teachers and students to use technology.

Availability of e-mail and other Internet functions goes beyond the "having it" stage. It must encompass educationally beneficial and appropriate uses. Ease of use of e-mail is important; however; usefulness is a more critical component if e-mail is to be accepted by technology users.

Training and support are two key components of successful use of e-mail. School systems must provide staff development opportunities that permit principals to become comfortable with e-mail. Support must include not only technical backing to make e-mail user-friendly but also curricular support. Curricular support is needed to produce educational benefits that are feasible and prudent. The availability of a computer at home enhances the use of the technology. School systems should explore the feasibility of providing home computers.

Educators are often viewed as being isolated - the teacher within four classroom walls, the principal within a school building, and the school system within its district boundaries. E-mail has the capabilities to break down barriers of geographical isolation and instill a sense of community.

A final implication rests with higher education institutions. Very few of the principals involved in this study received instruction on using computers or e-mail at the collegiate level. As principals are being prepared for leadership roles, they need to be provided opportunities to discover the benefits of such technologies as e-mail. The faculties in colleges of education need staff development concerning the effective use of technology. Thus future school leaders can be properly prepared to meet the challenges of an information age.

REFERENCES

Allen, M. W. (1992). Communication and organizational commitment: Perceived organizational support as a mediating factor. Communication Quarterly, 40(4), 357-367.

Amini, M. S. (1993). Facilitating communication in classroom. Journal of Computer Information Systems, 33(4), 34-38.

Amoroso, H. C., Jr., MacDonald, T. B., Shedletsky, L. J., Travers, T. (1993). Instructing K-12 teachers in computer networking and K-12 instructional practices in computer networking: Linking teachers and students to the global village. (ERIC Document Reproduction Service No. ED 364 212)

Aust, R., & Klayder, J. (1991). Global navigation in the year 2001. Proceedings of Annual Convention of the Association for Educational Communications and Technology. (ERIC Document Reproduction Service No. ED 334 973)

Babbie, E. (1986). The practice of social research (4th ed.). Belmont, CA: Wadsworth.

Beckner, W., & Barker, B. O. (1994). Technology in rural education: Fastback No. 366. Bloomington, IN: Phi Delta Kappa.

Berger, C. R. (1991). Chautaugua: Why are there so few communication theories? Communication Monographs, 58, 101-113.

Bishop, A. P. (1990). The national research and educational network(NREN): Promise of a new information environment. (ERIC Document Reproduction Service No. ED 327 219)

Borg, W. R., & Gall, M. D. (1989). Educational research: An introduction (5th ed.). New York: Pitman.

Bozeman, W. C., & Baubach, D. J. (1995). Educational technology: Best practices from America's schools. Princeton Junction, NJ: Eye on Education.

Bozeman, W. C., & Spuck, D. W. (1991). Technological competence: Training educational leaders. Journal of Research on Computing in Education, 23(4), 514-526.

Broholm, J. R. (1993). Networking on the network: Teachers and electronic mail. (ERIC Document Reproduction Service No. ED 362 154)

Bull, G., Harris, J., Lloyd, J., & Short, J. (1989). The electronic academical village. Journal of Teacher Education, 40(4), 27-31.

Bull, G., Hill, I., Guyre, K., & Sigmon, I. (1991). Building an electronic academical village: Virginia's public educational network. Educational Technology, 31(4), 30-36.

Cronin, M. J. (1994). Doing business on the Internet: How the electronic highway is transforming American companies. New York: VanNostrand Reinhold.

Crum, A. P. (1988). Factors which influence electronic mail use (Doctoral dissertation, University of Georgia, 1988). Dissertation Abstracts International, 49(11), 3240.

Davis, F. D., Bagozzi, R. P., & Warshaw. P.R. (1989). User acceptance of computer technology: A comparison of two theoretical models. Management Science, 35(4), 982-1003.

Dede, S. (1993). Leadership without followers. The Computer Teacher, 20(6), 9-11.

Denton, B. (1992). E-mail delivery of search results via the Internet. On-line, 16(2), 50-53.

Dern, D. P. (1994). The Internet guide for new users. New York: McGraw-Hill.

DeVellis, R. F. (1991). Scale development: Theory and application. Newbury Park, CA: Sage.

Festinger, L., & Katz, D. (1953). Research methods in the behavioral sciences. New York: Dryden.

Flank, S. G., & Livesey, L. (1993). Computers in education: A survey of computer technology in the Westchester/Putnam schools. (ERIC Document Reproduction Service No. ED 360 954)

Fulk, J., Steinfield, C. W., Schmitz, J., & Power, J. G. (1987). Social information processing: Model of media use in organizations. Communication Research, 14(5), 529-552.

Gay, L. R. (1992). Educational research: Competencies for analysis and application (4th ed.). New York: Macmillan.

Gilnes, D. (1991). Imagineering: Key to educational future. (ERIC Document Reproduction Service No. ED 332 310)

Gonring, M. P. (1991). Communication makes employee involvement work. Public Relations Journal, 47(11), 38-40.

Guthrie, J. W., Garms, W. I., & Pierce, L. C. (1988). School finance and educational policy enhancing educational efficiency, equality, and choice. Englewood Cliffs, NJ: Prentice-Hall.

Hall, S., & Hall, P. (1991). Between schools: Inter-class collaboration. (ERIC Document Reproduction Service No. ED 333 481)

Hawkins, J. (1993). Technology and the organization of schooling (Technical Report No. 281) New York: Center for Technology in Education. (ERIC Document Reproduction Service No. ED 359 933)

Hawley, C. (1996). Electronic mail: An examination of high-end users. Proceedings of 18th Annual Convention of the Association for Educational Communications and Technology. (ERIC Document Reproduction Service No. ED 397 772)

Hert, C. A. (1994). A learning organization perspective on training: Critical success factors for Internet implementation. Internet Research, 4(3), 36-44.

Hignite, M., & Perreault, H. (1993). Perceptions of emerging multimedia technologies. Journal of Computer Information Systems, 34(1), 89-93.

Hodgetts, R. M. (1984). Modern human relations at work. New York: Dryden.

Hoffman, C. (1993a). On the road to excellence in education. Appalachia: Journal of the Appalachian Regional Commission, 26(1), 4-11.

Hoffman, C (1993b). Education: Practicing what they teach. Appalachia: Journal of the Appalachian Regional Commission, 26(2), 31-35.

Honey, M., & Henriquez, A. (1993). Telecommunications and K-12 educators: Findings from a national survey. New York: Center for Technology in Education. (ERIC Document Reproduction Service No. ED 359 923)

Howell, D. C. (1992). Statistical methods for psychology (3rd ed.). Belmont, CA: Duxbury.

Hoy, W. K., & Miskel, C. G. (1991). Educational administration: Theory, research, and practice (4th ed.). New York: McGraw-Hill.

Huntington, F. W. (1995). An Internet primer for principals. Executive Educator, 17(1), 16-17.

Johnson, L. M., & White, C. S. (1990). An electronic mail facility for business statistics students. Computers & Education, 14(5), 445-451.

Keen, P. G. W. (1987). Telecommunication and organizational choice. Communication Research, 14(5), 588-606.

Kim, J. (1975). Multivariate analysis of ordinal variables. American Journal of Sociology, 81(2), 261-298.

Kim, J., & Mueller, C. (1978). Introduction to factor analysis: What it is and how to do it. Newbury Park, CA: Sage.

King, J. (1992). Business and industry. Appalachia: Journal of the Appalachian Regional Commission, 25(1), 6-9.

Kurshan, B. (1980). Educational telecommunications connections for the classroom: Part I. The Computer Teacher, 17(6), 30-31.

LaQuey, T., & Ryer, J. (1993). The Internet companion. Reading, MA: Addison-Wesley.

Keen, P. G. W. (1987). Telecommunications and organizational choice. Communication Research, 14(5), 588-606.

Lewis, L. K. (1991). Interactive communication technologies in organizations. Communication Education, 40(2), 202-212.

Lincoln, Y. S. (1992). Virtual community and invisible colleges: Alterations in faculty, scholarly networks, and professional self-image. (ERIC Document Reproduction Service No. ED 352 903)

Long, C. (1985). Yellow pages for principals: Networks in action. Phi Delta Kappa, 66(8), 574-575.

Lundgren, T. D., & Garrett, N. A. (1991). Computer expectations. The Journal of Computer Information Systems, 31(4), 9-11.

Maddux, C. D. (1994). The Internet: Educational prospects and problems. Educational Technology, 34(7), 37-42.

Markus, M.L. (1987). Toward a "critical mass" theory of interactive media: Universal access, interdependence, and diffusion. Communication Research, 14(5), 491-511.

Merritt, S. M. (1991). Telecommunications software for education: The community network model. Computer Education, 17(4), 317-321.

Muffo, J. A., & Snizek, W. E. (1987). Planning for the social disruption of the microcomputer revolution in academe. (ERIC Document Reproduction Service No. ED 290 397)

Murphy, M. A. (1991). No more "what is communication?". Communication Research, 18(6), 825-833.

Naron, N. K., & Estes, N. (1986). Technology in the schools: Trends and policies. AEDS Journal, 20(1), 31-43.

National Commission on Excellence in Education (1983). A nation at risk. Washington, DC: U. S. Government Printing Office.

National Policy Board for Educational Administration (1989). Improving the preparation of school administrators. Charlottesville, VA: University of Virginia, Curry School of Education.

Oliver, P., Marwell, G., & Teixeira, R. (1985). A theory of critical mass: Interdependence, group heterogeneity, and the production of collective action. American Journal of Sociology, 91(3), 522-556.

Ornstein, A. C. (1992). Making effective use of computer technology. NASSP Bulletin, 76(542), 27-33.

Pankake, A. M., Stewart, G. K., & Winn, W. (1990). Choices for effective communication: Which channels to use? NASSP Bulletin, 74(529), 53-57.

Papa, M. J., & Graham, E. E. (1991). The impact of diagnosing skill deficiencies and assessment-based communication training on managerial performance. Communication Education, 40(4), 368-384.

Pedras, M. J., & Horton, J. (1996). Using technology to enhance teacher preparation. Proceedings of Annual

Meeting of the Northwest Association of Teacher Educators. (ERIC Document Reproduction Service No. ED 395 929)

Ray, E. B. (1993). When the links become chains: Considering dysfunction of supportive communication in the work place. Communication Monographs, 60(1), 106-111.

Redding, W. C. (1992). Response to professor Berger's essay: Its meaning for organizational communication. Communication Monographs, 59(1), 87-92.

Rice, R. E., & Case, D. (1981). Electronic Messaging in the university organization. (ERIC Document Reproduction Service No. ED 209 706)

Roempler, K. S., & Warren, C. R. (1993). Computer networks for science teachers. Columbus, OH: ERIC Clearinghouse for Science, Mathematics, and Environmental Education. (ERIC Document Reproduction Service No. ED 359 044)

Russell, A. L. (1996). Six stages for learning to use technology. Proceedings of 18th Annual Convention of the Association for Educational Communications and Technology. (ERIC Document Reproduction Service No. ED 397 772)

Ryder, M., & Wilson, B. (1996). Affordances and constraints of the Internet for learning and instruction.

Proceedings of 18th Annual Convention of the Association for Educational Communications and Technology. (ERIC Document Reproduction Service No. ED 397 772)

Saraswat, S. P. (1991). Telecommunications technology and the competitive advantage: An organizational perspective. Journal of Computer Information Systems, 32(2), 2-5.

Schaeffer, R. L., Mendenhall, W., & Ott, L. (1986). Elementary survey sampling (3rd ed.). Boston: Duxbury.

Schmitz, J., & Fulk, J. (1991). Organizational colleagues, media richness, and electronic mail. Communication Research, 18(4), 487-523.

Schramm, W. (1963). Communication research in the United States. In W. Schramm (Ed.). The science of human communication (pp. 1-16). New York: Basic Books.

Seals, W. M., Simantal, F., Lambert, P., White, C., Reden, S., & Jensen, C. (1987). The business educational lab and local area networking for curriculum improvement. (ERIC Document Reproduction Service No. 340 855)

Sivin-Kachala, J. P., & Bialo, E. (1992). Using computer-based telecommunications services to serve educational purposes at home. New York: Interactive

Educational Systems Design, Inc. (ERIC Document Reproduction Service No. ED 354 853)

Sproull, L., & Kiesler, S. (1986). Reducing social context cues: Electronic mail in organizational communications. Management Science, 32(11), 1492-1512.

Sproull, L., & Kiesler, S. (1991). Computers, networks, and work. Scientific American, 265(3), 116-123.

Spurgin, J. B. (1985). Educator's guide to networking: Using computers. Austin, TX: Southwest Educational Development Lab. (ERIC Document Reproduction Service No. ED 270 089)

Steinfield, C. W., & Fulk, J. (1987). The role of theory in research on information technologies in organizations. Communication Research, 14(5), 479-490.

Stout, C. (1991). Telecommunications: A statewide approach to link educators. Educational Technology, 31(4), 44-46.

Taitt, H. A. (1993). Technology in the classroom: Planning for educational change (NASSP Curriculum Report, 22,(4), March 1993). Reston, VA: National Association of Secondary Principals. (ERIC Document Reproduction Service No. ED 359 922)

Thorn, B. K., & Connolly, T. (1987). Discretionary data bases: A theory and some experimental findings. Communication Research, 14(5), 512-528.

Trevino, L. K., Lengel, R., Daft, R. L. (1987). Media symbolism, media richness, and media choice in organizations: A symbolic interactionist perspective. Communication Research, 14(5), 533-574.

Updegrove, D. A., Muffo, J. A., & Dunn, Jr., J. A. (1989). Electronic mail and networks: New tools for institutional research and universal planning (AIR Professional File, No. 34) Tallahassee, FL: Association for Institutional Research. (ERIC Document Reproduction Service No. ED 317 142)

Updegrove, D. A. (1991). Electronic mail in education. Educational Technology, 31(4), 37-40.

Waldron, V. R. (1991). Achieving communication goals in superior-subordinate relationships: The multi-functionality of upward maintenance tactics. Communication Monographs, 58, 289-306.

Watson, F. C. (1988). Florida information resource network. Learning Tomorrow: Journal of the Apple Education Advisory Council, 4(Winter), 99-110.

Wilson, B., Ryder, M., McCahan, J., & Sherry, L. (1996). Cultural assimilation of the Internet: A case study. Proceedings of 18th Annual Convention of the Association for Educational Communications and Technology. (ERIC Document Reproduction Service No. ED 397 772)

Wishnietsky, D. H. (1991). Using electronic mail in an educational setting. Bloomington, IN: Phi Delta Kappa.

Zahn, G. L. (1991). Face-to-face communication in an office setting: The effects of position, proximity, and exposure. Communication Research, 18(6), 737-754.

APPENDICES

APPENDIX A

SURVEY INSTRUMENT

School Identification Code Number____________________

(Will be removed upon return of survey)

==

E-MAIL SURVEY OF PRINCIPALS

INSTRUCTIONS: Please mark the appropriate response or fill in the space provided. Please answer all questions whether you do or do not use e-mail.

1. Gender Male____Female__

2. Age (in years) _____

3. Highest Degree Bachelor's__ Master's___Master's +__ EdS__Doctorate___

4. Total years experience in education as a teacher or administrator____

5. Current principal position Elementary (K-4, K-6, or K-8)____

Middle/Jr. High (5-8, 6-8, 7-9)__

High School (9-12, 10-12) ____

6. Number years in current position ____

7. Total number of years of experience as a principal ____

8. Do you have a computer in your office? Yes____ No____

9. If yes, does it have a modem? Yes___ No___Don't Know____

E-mail is the ability to send and receive information/messages electronically from one computer to another computer.

10. Can you send/receive e-mail in your school? Yes___ No____
(If no, go onto Question 15.)

A number of providers of e-mail services are available. Below is a listing of several types and specific examples of each:

(1) Commercial Services - such as America On Line, Prodigy, CompuServ, & Delphi.

(2) State Educational Services - such as TEN-Tennessee Educators Network; FIRN-Florida Information Resources Network; Virginia PEN-Virginia Public Education Network; WVEIS- WV Educational Information System.

(3) Local "in-house" e-mail services

(4) Higher Educational Institutions

BEST COPY AVAILABLE

11. What is your primary e-mail provider? Indicate the type and specific name of the provider, i.e. if it is the Commercial Service - America On Line, you would enter 1 - America On Line.
____

12. If you have a secondary e-mail provider, indicate it in the same manner that you did in Question 11.
____

13. Other than your office, are there other locations at your work site with a computer that can be used to access e-mail?Yes__ No___Don't Know__

Below are ways that e-mail services can be financed:

1- personally by you
2- PTA or community donations
3- local funds
4- state funds
5- federal funds
6- grant money
7- other

14. Using the list above indicate (by number) the primary way that e-mail services are financed in your school: _____

If "7- other" was selected, specify way ______________________________

15. Do you have a computer at home? Yes___ No___

16. Do you access e-mail from Home? Yes___ No___

17. What is your e-mail service provider at home? Indicate it in the same manner that you answered Question 11.______________________________

18. How many years have you used a personal computer? _____

19. How long (**in months**) have you been using e-mail? _____

Using the following scale:

1- Poor
2- Fair
3- Average
4- Above Average
5- Proficient

20. How do you rate your overall computer literacy/use skills? _____

21. How do you rate your keyboarding/typing skills? _____

Below are several methods by which individuals receive training.

1 - Self-taught
2 - Conferences or workshops
3 - Instructions from spouse or friends
4 - Courses offered by district/system
5 - Courses by State Educational Agency
6 - Instruction from colleagues
7 - Training through a volunteer mechanism at a university or college, i.e. TN Virtual School
8 - On-site consultants
9 - Courses offered over networks
10 - Simulation software
11 - Video training tapes
12 - College Courses

Using the list above indicate by number:

22. The **primary** method by which you received **training in computer use**
______

23. The **primary** method by which you received **training in e-mail**
______

24. A **secondary** method you received **training in computer use**
______

25. A **secondary** method by which you received **training in e-mail**
______

26. Using the following scale, how often do you personally check your e-mail?

1- Once a month
2- Twice a month
3- Once a week
4- Two - three times a week
5- Daily
6- More than once a day

______

27. How many e-mail messages do you **send** in a typical week?
______

28. How many e-mail messages do you **receive** in a typical week?
______

29. Is e-mail used by your superiors? Yes___ No___ Don't know__

30. Is e-mail used by your fellow principals? Yes___ No___ Don't know__

31. Is e-mail used by your teachers? Yes___ No___ Don't know__

Of the following types of messages, please **circle the number** that best describes how often you **send** that type of message:

	Never	Monthly	Weekly	Daily
32. administrative in nature	1	2	3	4
33. requests/searches for information	1	2	3	4
34. social	1	2	3	4
35. announcements	1	2	3	4
36. other (specify)________________	1	2	3	4

Of the following types of messages, please **circle the number** that best describes how often you **receive** that type of message:

	Never	Monthly	Weekly	Daily
37. administrative in nature	1	2	3	4
38. information retrieval	1	2	3	4
39. social	1	2	3	4
40. announcements	1	2	3	4
41. other (specify)________________	1	2	3	4

A **listserv** is an automatic discussion list service that receives electronic messages and automatically re-transmits them to all addresses that have subscribed to that electronic list.

42. Are you on any listservs? Not aware of listservs____ Yes___ No___

43. If Yes to Q. 42, to how many listservs do you subscribe? ______
Please list them:____
____

44. How many listserv messages do you send/receive in a typical week? ______

Below are a series of statements that **may or may not influence your use of e-mail**. Using the scale below, please **circle** the response that ***you*** feel best expresses how important that statement is in your use or non-use of e-mail:

	Level of Importance			
	None	Slight	Somewhat	Very
45. Comfort with using computers	1	2	3	4
46. Software difficult to understand	1	2	3	4
47. Trouble with phone lines	1	2	3	4
48. Individuals with whom to communicate	1	2	3	4
49. Effective communication aid	1	2	3	4
50. Speed of communication	1	2	3	4
51. Length of e-mail messages	1	2	3	4
52. Prefer to use telephone and/or letters	1	2	3	4
53. Cost of e-mail system	1	2	3	4
54. Training from a friend or colleague	1	2	3	4
55. Insufficient computer training	1	2	3	4
56. Fear of making a spelling or grammar mistake in an e-mail message	1	2	3	4
57. Higher priority of other responsibilities	1	2	3	4
58. More productive with e-mail use	1	2	3	4
59. Proficiency of typing skills	1	2	3	4
60. Received info. important to my job	1	2	3	4
61. Using e-mail enhances my prestige	1	2	3	4
62. Training that I received on e-mail	1	2	3	4
63. Access to computer hardware	1	2	3	4
64. Access to appropriate software	1	2	3	4
65. Availability of a consultant to help when problems arise	1	2	3	4

66. Ability to learn e-mail system	1	2	3	4
67. Encouragement to use e-mail by system	1	2	3	4
68. Pressure by superiors	1	2	3	4
69. Pressure by fellow principals	1	2	3	4
70. Pressure by teachers	1	2	3	4

APPENDIX B

LETTERS

Micheal T. Carter
183 Carden Drive
Elizabethton, TN 37643
(423) 543-5083

February 5, 1996

Dear Principal:

I am presently employed by the Kingsport City (TN) School System and pursuing a Doctorate in Education at East Tennessee State University. I am attempting to determine the factors that influence principal use or non-use of e-mail. You were randomly selected to participate in this study by completing a survey.

As an educator, I am aware of the demands of your daily work load. However, your input is vital to the study. The school identification number on the survey instrument will be used to track returned surveys. It will be discarded upon receipt of the survey so that confidentiality will be maintained. If you would like a summary of these findings, please indicate on the separate form provided and return that request in a separate envelope.

Please complete the survey and return it to me in the enclosed self-addressed stamped envelope. I would appreciate receiving it by February 23, 1996.

Thank you for your assistance.

Sincerely yours,

Micheal T. Carter

Enclosure

Micheal T. Carter
183 Carden Drive
Elizabethton, TN 37643
(423) 543-5083

March 23, 1996

Dear Principal:

Recently, I sent you a letter indicating that your school had been randomly selected to participate in a study to determine the factors that influence the use of electronic mail by K-12 principals in the Appalachian Region. I have been extremely pleased with the manner in which the surveys have been returned.

We allowed a deadline of February 23, 1996 for the return of the survey. Your survey has not been received at this time. I am aware of the harsh winter that we have experienced, and this unusual occurrence could have hindered the return of the survey. Additionally, whether you do or do not use e-mail, your responses to the survey items will be quite beneficial in determining those factors that influence a principal's use or non-use of e-mail. I have enclosed an additional copy of it along with a self-addressed stamped envelope just in case the initial survey has been misplaced. It would be greatly appreciated if you would take a short amount of time to complete it.

Please complete the survey and return it to me in the enclosed self-addressed stamped envelope. I would appreciate receiving it by April 12, 1996.

Thank you for your valuable time to assist in making this study a success.

Sincerely,

Micheal T. Carter

Enclosure

Request to Receive Findings of the Study Dealing with Factors that Influence the Use of E-Mail by K-12 Principals

I am interested in the findings of this study. Please send me the findings when the study is completed. Please mail the results to:

Name: ______________________________

Title: ______________________________

School System: ______________________________

School: ______________________________

Address: ______________________________

____

City, State, Zip: ______________________________

Mail this form to: Micheal T. Carter
183 Carden Drive
Elizabethton TN 37643

Please Mail in Separate Envelope

VITA

MICHEAL TRUMAN CARTER

Personal Data:	Date of Birth: October 8, 1946 Place of Birth: Nashville, Tennessee Marital Status: Married with four children
Education:	Public Schools, Nashville, Tennessee University of Tennessee, Knoxville, Tennessee; Mathematics, B.S., 1968 University of Tennessee, Knoxville, Tennessee; Science Education, M.S., 1975 East Tennessee State University, Johnson City, Tennessee; Educational Administration and Supervision, Ed.S., 1980 East Tennessee State University, Johnson City, Tennessee; Ed.D., Educational Leadership and Policy Analysis, 1997
Professional Experience:	Teacher, John Sevier Middle School; Kingsport, Tennessee, 1976-1984 Computer Skills Consultant, Tennessee State Department of Education; Johnson City, Tennessee, 1984-1987 Adjunct faculty, Dept. Of Mathematics, East Tennessee State University; Johnson City, Tennessee, 1984-1987, 1990 Teacher, Robinson Middle School; Kingsport, Tennessee, 1987-1991 Teacher, John Sevier Middle School; Kingsport, Tennessee, 1991-1997 Adjunct faculty, Northeast State Technical Community College; Blountville, Tennessee, 1982-1983, 1993-1997
Professional Memberships:	Phi Beta Kappa, Phi Kappa Phi, Phi Delta Kappa Association of Supervision and Curriculum Development, TN ASCD National Council of Teachers of Mathematics Tennessee Middle School Association